

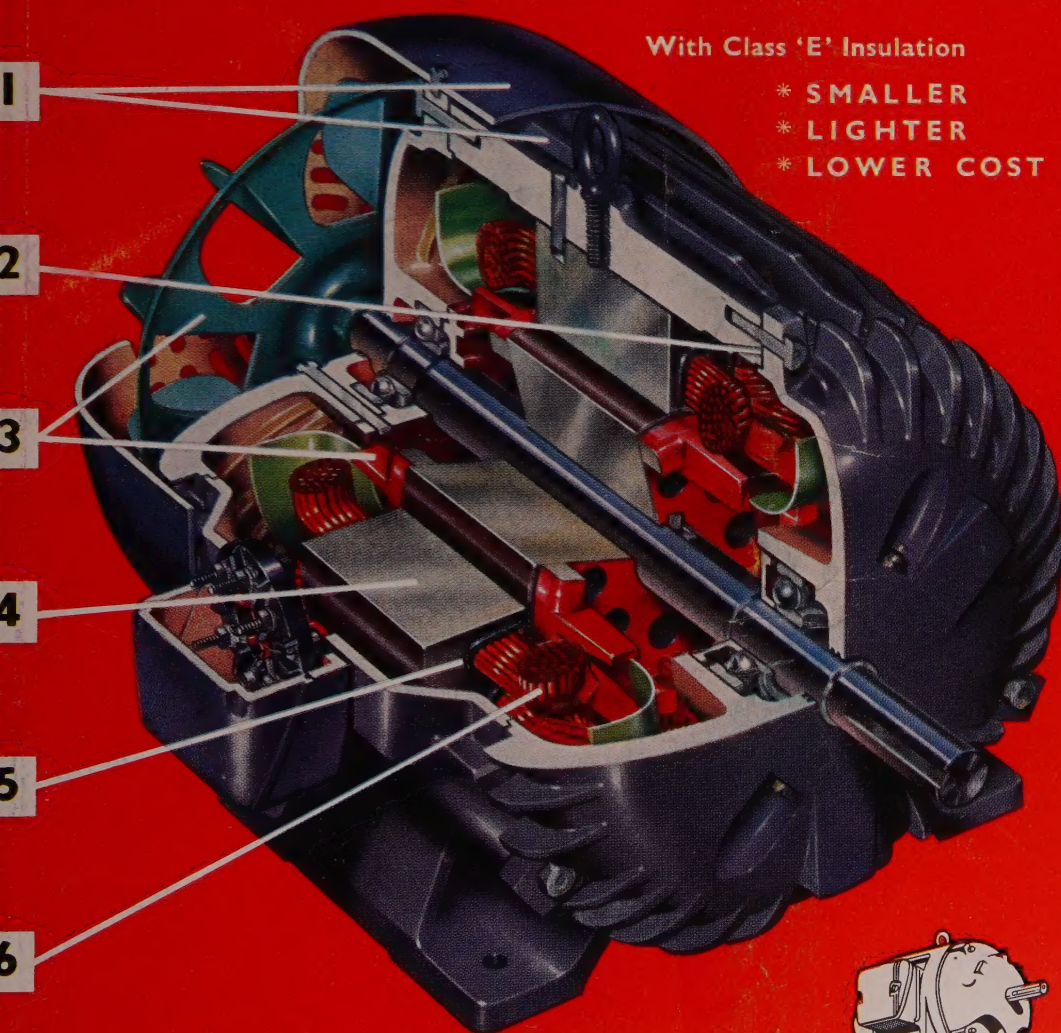
ELECTRICAL REVIEW

FRIDAY
NOVEMBER 1960

WEEKLY
PRICE 1s 6d

BROOK

'D' TYPE TOTALLY ENCLOSED FAN COOLED MOTORS



With Class 'E' Insulation

- * SMALLER
- * LIGHTER
- * LOWER COST

1 Strong ribs on the yoke, with matching ribbing on the endshields carry a stream of cooling air from the fan to dissipate heat. A deepened fan cover, which extends over the yoke keeps the air in close proximity to the motor.

2 Close fitting endshields prevent the entry of dust particles or moisture into the motor interior. Grease relief plugs are fitted to assist flushing out spent grease.

3 Internal fans integrally cast with the rotor and flumes inside the internally ribbed endshields help the circulation of air inside the motor and eliminate "hot spots".

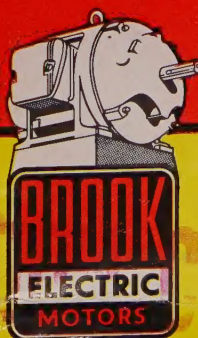
4 Stampings of high grade annealed alloy steel are assembled under pressure and pegged rigidly to the stator frame. Rotor stampings are keyed to the shaft.

5 Slot insulation consists of electrical paper bonded to a Melinex film, while the winding coils are preformed in phenolic resin covered wire. The winding complies with Class 'E' Specification. Dipping and baking in a superior quality insulating varnish completes the protection.

6 Coil Winding . . . By the introduction of new methods of coil winding, internal connections are kept to the minimum.



World's Most
Respected Motor



BROOK MOTORS LTD
HUDDERSFIELD

SKYLINE

by **BEN7AMIN**
REGD.

*Flowing lines
of light...*



'Sky-Line'...in single, elegant fittings or coupled in flowing lines
for hotels, stores, supermarkets, offices and all commercial areas.

Please write for illustrated brochure.

better lighting by



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49 Basinghall Street · Tel: Leeds 25579

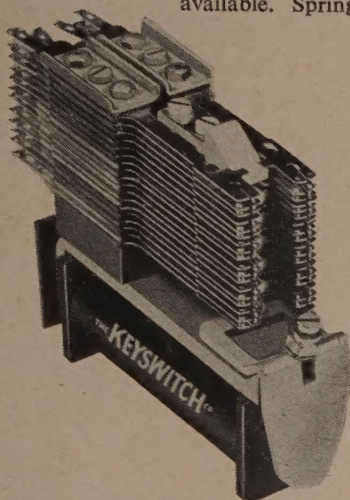
BRISTOL
Royal London Building · Baldwin Street
Telephone: Bristol 28406

Men in the Know

HAVE THE RIGHT CONTACTS

MAJOR TYPE 'BPO 3000'

The best known and most useful relay available. Spring sets allow from one make or break to 12 changeovers. For minute or heavy switching. Sensitivity down to 20 milliwatts. Adjustable for critical timing, fast or slow operation. Standard or Tropical finish. Special adaptations can be supplied.



Transparent covers for above now available.

and now PLUG-IN 3000 Type Relays.

Plug-in facilities in addition to all the versatility and well-established, reliable features of the world's best known relays.

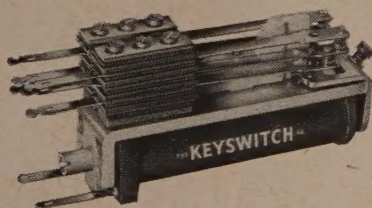
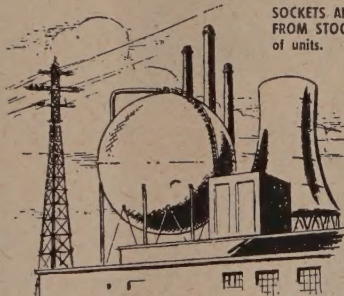
- ★ Positive contact between male and female pins.
- ★ Contacts: up to 18 light duty or 12 heavy duty.
- ★ Complete transistorized units.
- ★ AC or DC operation.
- ★ Transparent or metal cover.
- ★ Clip retains relay positively in any position.



SOCKETS AND FITTINGS ARE AVAILABLE FROM STOCK for immediate assembly of units.

PLUG-IN TRANSISTORIZED UNIT.

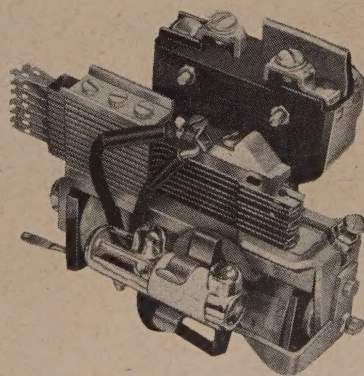
Operation AC or DC. Switching or Signal Current AC or DC. 5 to 500 micro-amps. Transfer switching current 10 amps. or 500v.



MINOR TYPE '600' (Fitted with double pole changeover for 250 volts 2 amps.)

Ideal for simple switching operations where lightness, compactness and economy are prime considerations. When fitted with contacts similar to those of the 'B.P.O. 3000' type it is faster in operation and release.

This relay incorporates 15 amp. Micro Switch; 5 amp. Mercury Switch and standard 0.3 to 8 amp. contacts.



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Telephone: PADdington 2231

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BIG in application.

BIG in technical experience.

BIG in production resources.

—this sums up the Taylor Tunnickliff organisation, one of the great names in Porcelain Insulation. No project is too large or too difficult for us to consider, and nearly always we can tackle it successfully. Let us discuss your insulation problems with you. Early advice is often the most valuable. We can give better service if we are consulted at the initial design stages.



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electricity respects
in a **BIG** way!

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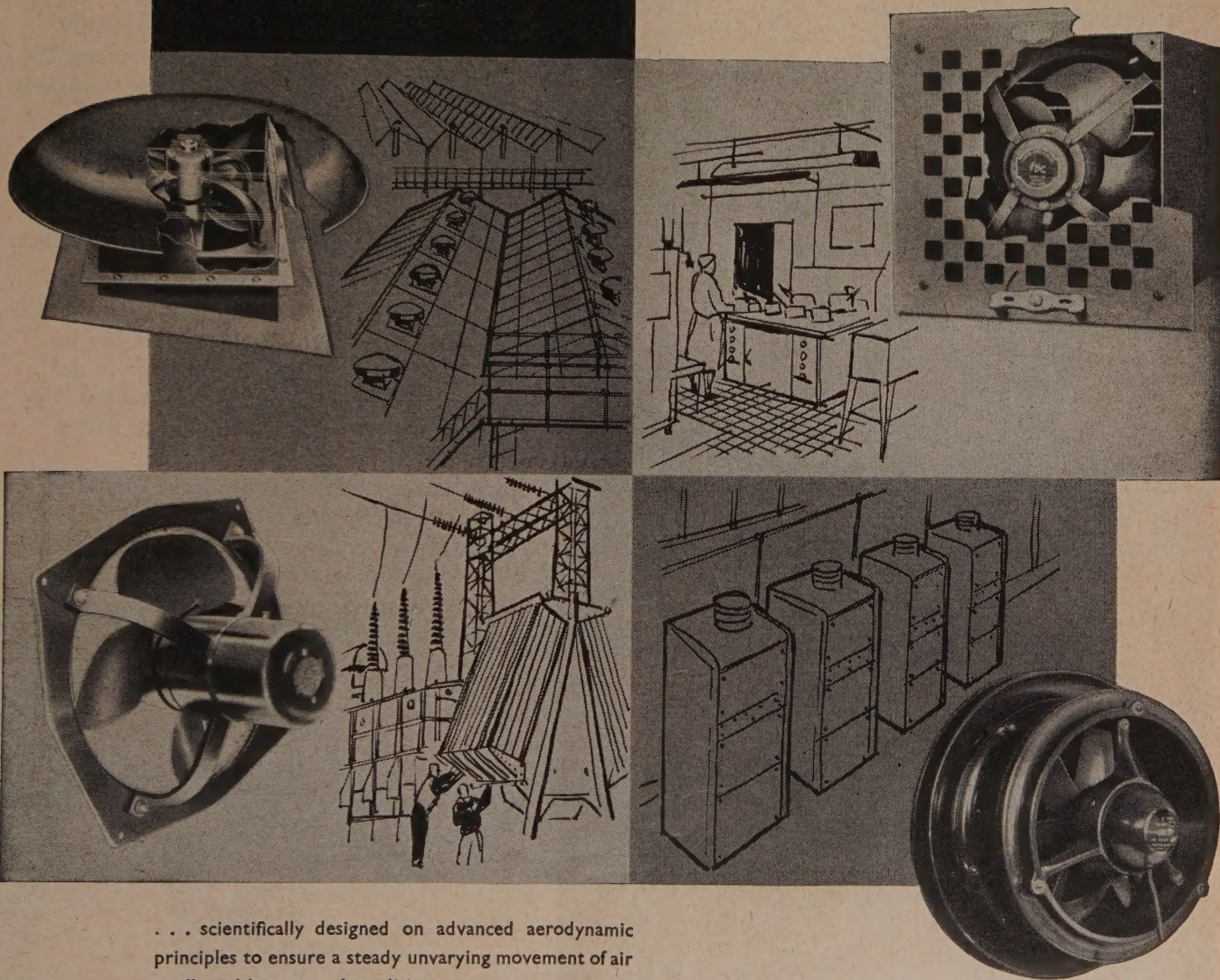


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P.3202

Workshop angle and D.O. viewpoint



Now that machining costs are so high, the legibility of working drawings has become of supreme importance. ILFORD Azoflex photoprinting papers give maximum legibility combined with speed of production and long life in normal storage and use. That is the workshop angle combined with the viewpoints of the drawing stores and D.O.

More specifically, the D.O. is interested in the Azoflex dyeline process because no ducting or darkrooms are necessary; the process is dry, there are no fumes or excessive heat generated.

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Photograph by courtesy of Duraglass Limited



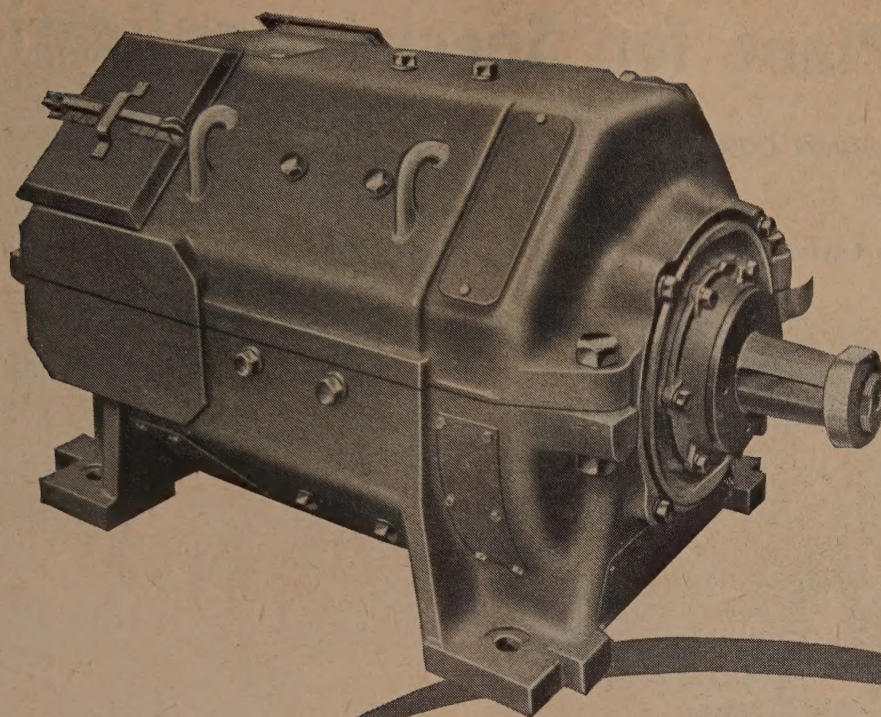
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Many business and industrial concerns find that it pays to hire certain AZOFLEX machines — rather than buy them outright. Enquiries will be treated with the utmost discretion, and will not commit you in any way.

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for choosing
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Over 4,000 MDX-type mill motors have gone into service during the last eight years in leading iron- and steel-producing works in Britain and many other parts of the world. They have established a good reputation for efficient and continuous duty. Remarkable reliability and strength, together with low inertia of rotating parts, make MDX motors ideal for driving a wide range of steelworks equipment. They have been specifically designed to withstand arduous service and are unaffected by heavy overloads. Available totally enclosed, up to 200 h.p., self-ventilated, up to 250 h.p.

Please write for further details to INDUSTRIAL
MACHINES DEPT, TRAFFORD PARK, MANCHESTER 17

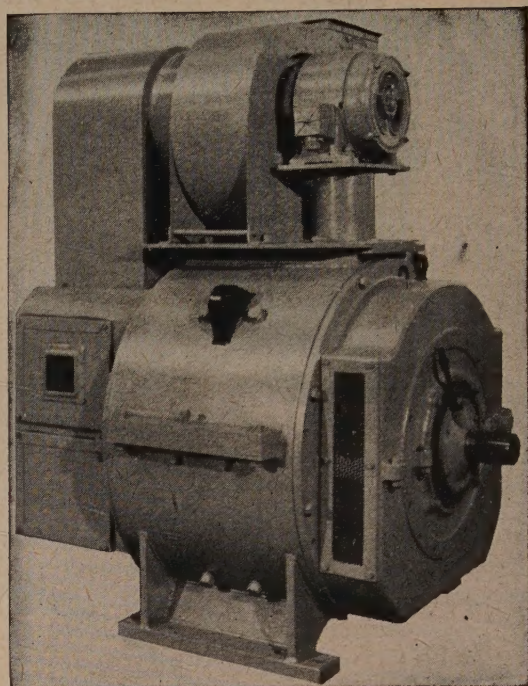
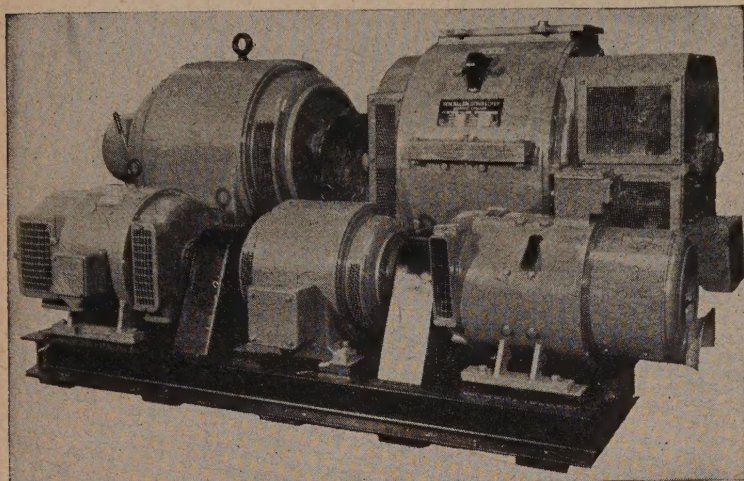
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Associated Electrical Industries Limited
Motor and Control Gear Division
RUGBY & MANCHESTER

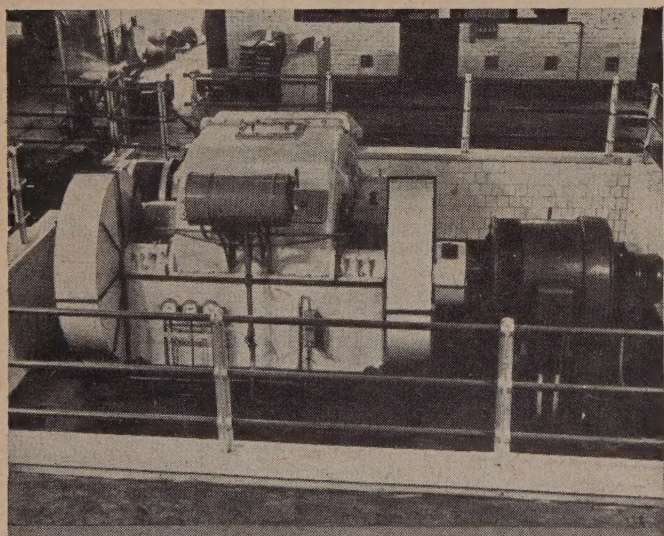
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*Special Ward Leonard Equipment
supplied by us for
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LEFT : Main motor generator set, output 0/220 volts, 200 kW max. In the foreground auxiliary set giving two D.C. voltages for drives to a calender. RIGHT : Work motor 240 h.p. 0/220 volts D.C., speed range 0/1500.



FOUR 400 h.p. ROLLING MILL MOTORS by *English Electric Co.*, 738 r.p.m. to final 30 r.p.m. With control gear.

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The WAITING ROOM TIMER is fully enclosed in a robust cast aluminium case, with lugs for wall mounting and provision for conduit entry. Rating, 15 amps. 200/250v A.C.

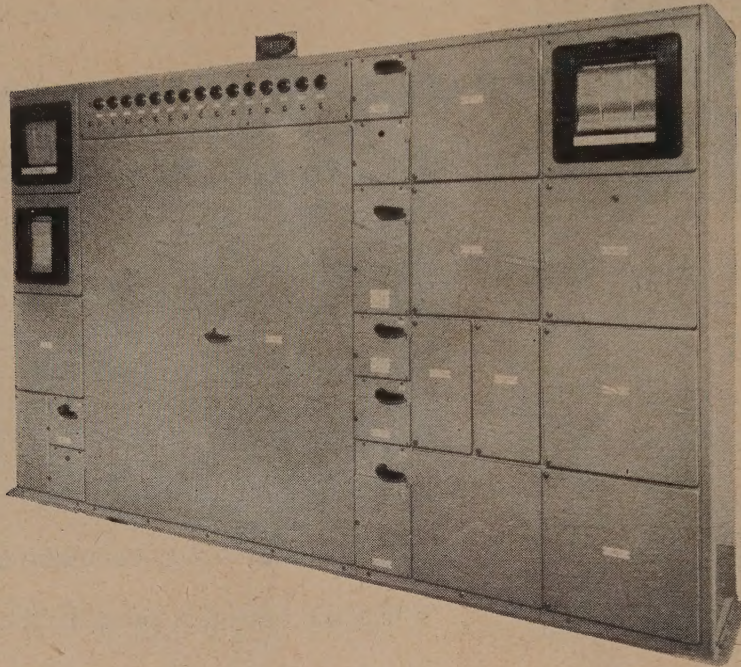
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Time Switches

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OUR CUBICLE AND PEDESTAL TYPE SWITCHBOARDS ARE
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SWITCHGEAR
IS BEING INSTALLED
IN
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OUR RANGE INCLUDES:

- Distribution fuseboards without and with built-in isolators.
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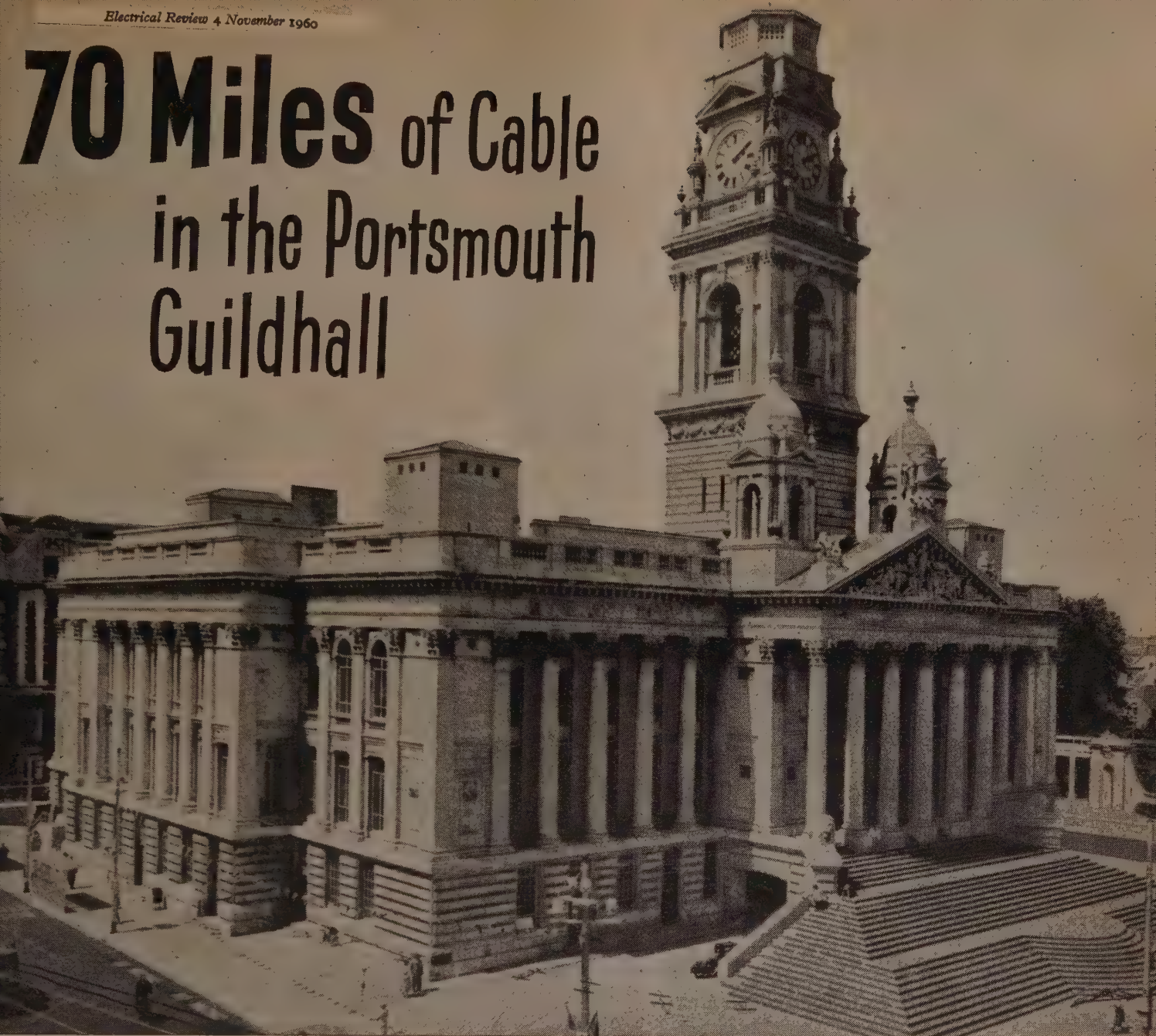
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70 Miles of Cable in the Portsmouth Guildhall



Gutted by fire bombs in 1940 Portsmouth's historic Guildhall has now been rebuilt and the interior completely redesigned in modern style, making it one of the finest civic centres in the country.

Seventy miles of BICC P.V.C. cables were installed by Messrs. Grierson Ltd., of 140 Cromwell Road, London, S.W.7, for over two thousand lighting and socket outlets.

Other BICC cables used in this building include paper insulated cables for lifts, concert and conference halls, mineral insulated cables for rising mains, butyl rubber cables for the boiler house, and screened cables for the sound systems.


*Architect : Mr. E. Berry Webber, F.R.I.B.A.,
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*Electrical Consultant : Mr. H. A. Sandford, M.A.,
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*high speed
deliveries of
cables from stock*

WIRING CABLES
for every type of installation



room for
three more
inside

Are electrical design engineers ever impressed? Do they whistle with admiration at such things as servo-components?

If they do, many we suspect, will be whistling soon at this range of Siemens-Halske

miniature, high efficiency D.C. motors. Available in three sizes, the largest of which measures only two inches long by one inch in diameter, these motors have working voltages which go up to 4v D.C., but they will turn on a signal as low as 50 m.V. Available torques are up to 270

cm. grms at 170 r.p.m., or down to 18 cm. grms at 2,500 r.p.m., with an electro to mechanical efficiency of as high as 70%. The working temperature range is -35 degrees to +65 degrees C.

If you would like further information on these or our A.C. servo range, please write to:—

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LIMITED

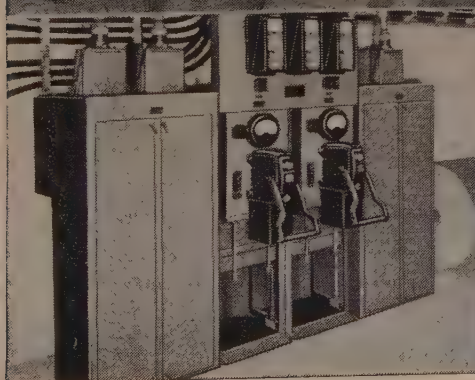
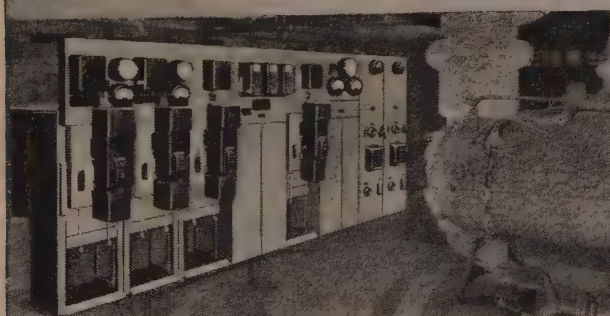
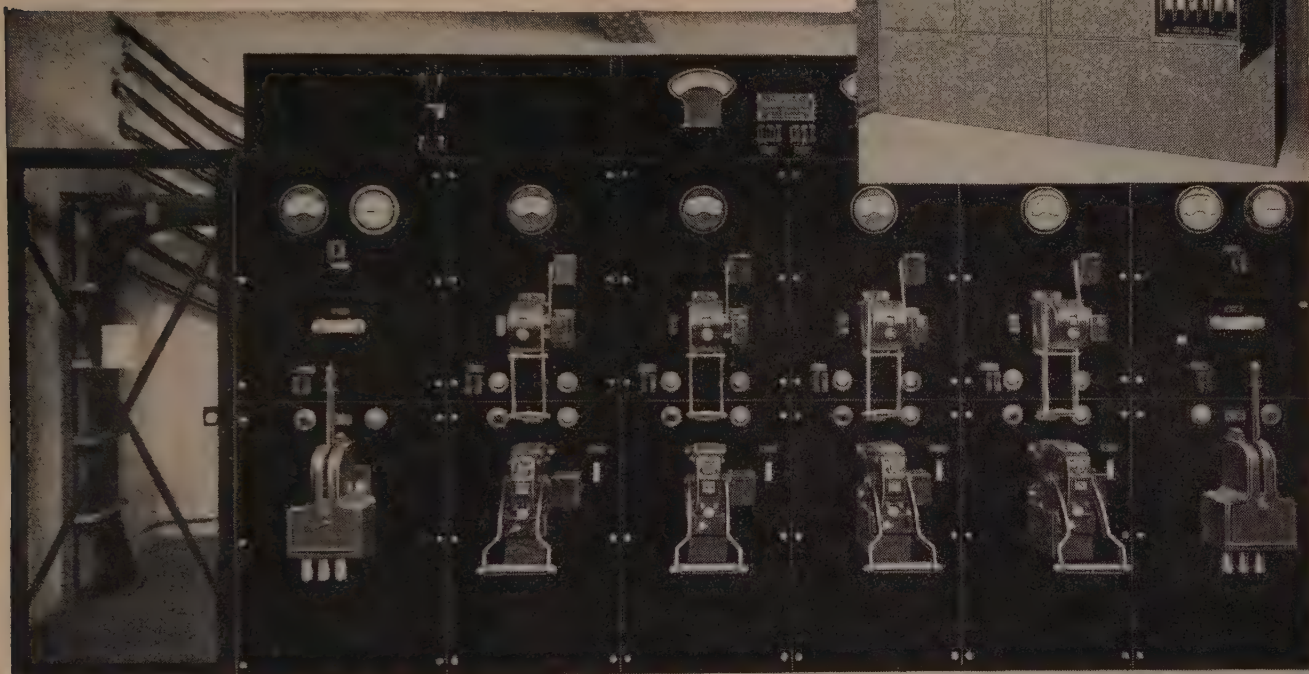
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 SWITCHGEAR & MOTOR CONTROL GEAR

Where speed and time factors dominate the working day, utmost reliability and efficiency are obviously vital. The choice of "ERSKINE HEAP" SWITCHGEAR and MOTOR CONTROL GEAR is meeting these stringent requirements for the Liverpool Daily Post & Echo. This is one of the many Newspaper offices in the British Isles and abroad that have installed our Switchgear.



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 GRAND BUILDINGS, TRAFALGAR SQ., W.C.2

BRANCH OFFICES AND AGENCIES IN ALL PARTS OF THE WORLD



QUICKWAY

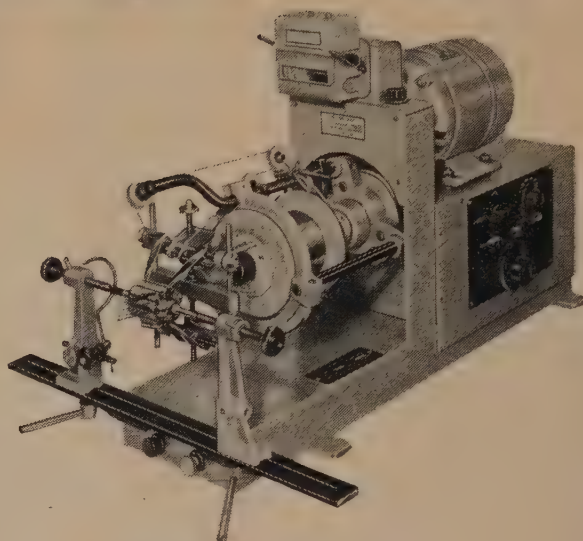
Armature winding machines

The "QUICKWAY" Armature Winding Machine has been re-designed and improved. A new infinitely variable speed D.C. drive has been incorporated and provides a smooth stepless variation up to 1000 turns per minute.

The equipment is bench mounted for use on a standard single phase supply, the D.C. voltage being obtained from integral rectifiers.

Dynamic braking is provided giving a constant retarding torque over the whole winding speed range and is controlled by an automatic turns counter.

Capacity: 45—24 S.W.G. wire size.
3" core dia.
2½" core length.



Send for details to the "QUICKWAY" Department.

THE MIDLAND DYNAMO CO. LTD.

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A NEW NAME MEANING
COMPLETE SAFETY IN
POWER SUPPLIES TO
TRAVELLING
CRANES



Manguard

SAFETY SUPPLY SYSTEM
(Prov. Patent No. 31868/88)

PRINCIPLE

The principle of Manguard is the provision of a set of flexible bar collectors on the crane and electrically protected contact boxes at intervals along the crane track connected by insulated cable.

SAFETY FEATURES

- Contact box spacing ensures an electrical supply to the crane at all times.
- Each contact box has its own contactor ensuring that the contact studs are alive only when in contact with the crane collector bars.
- The crane collector box is fabricated in fibreglass. The four contact bars are bedded in flexible polyurethane, giving long life and minimum maintenance.
- Isolation of any section may be readily carried out.
- MANGUARD equipment may be fitted to existing cranes.



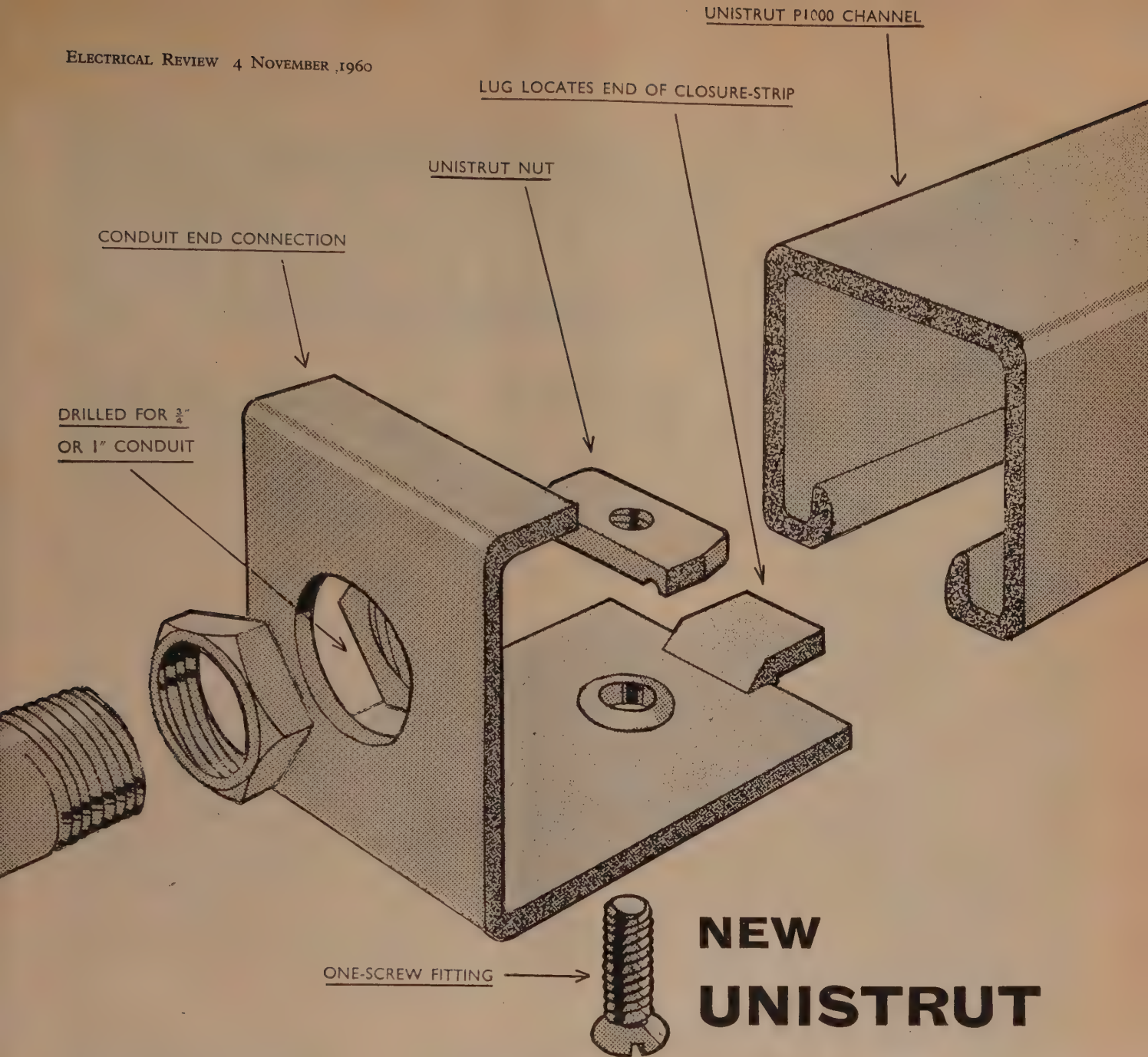
BERGUE

MACHINE TOOLS LIMITED

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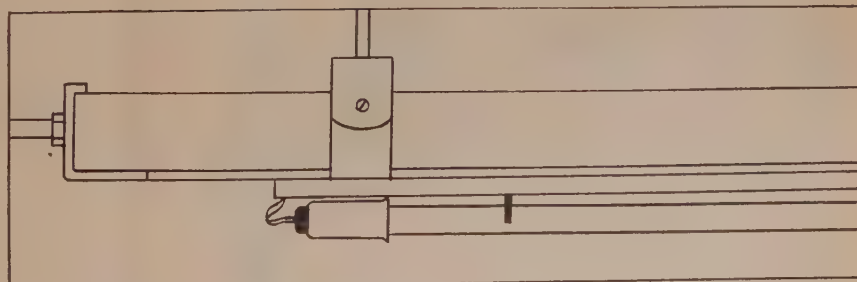
NEW UNISTRUT CONDUIT END CONNECTIONS

SPEEDS FLUORESCENT INSTALLATION

This new component neatly and quickly effects the change-over from conduit to Unistrut channel where the latter is used as fluorescent lighting trunking. It is secured by a single screw to a self-locating nut in the channel, and is supplied ready drilled for either 1" or $\frac{3}{4}$ " conduit.

The connection may be used either where the individual fluorescent fittings are secured direct to the Unistrut channel, or where the channel is clamped to high roof-beams, etc. with the individual fittings on droppers. In either case, wiring accommodated in the channel is neatly concealed by a snap-in closer strip.

The Unistrut conduit end connection is available in Unistrut green stove enamel finish or electro-plated. Please write for drawings to include in your Unistrut Parts Catalogue.



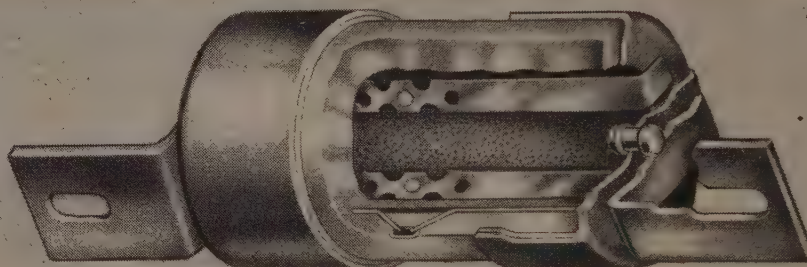
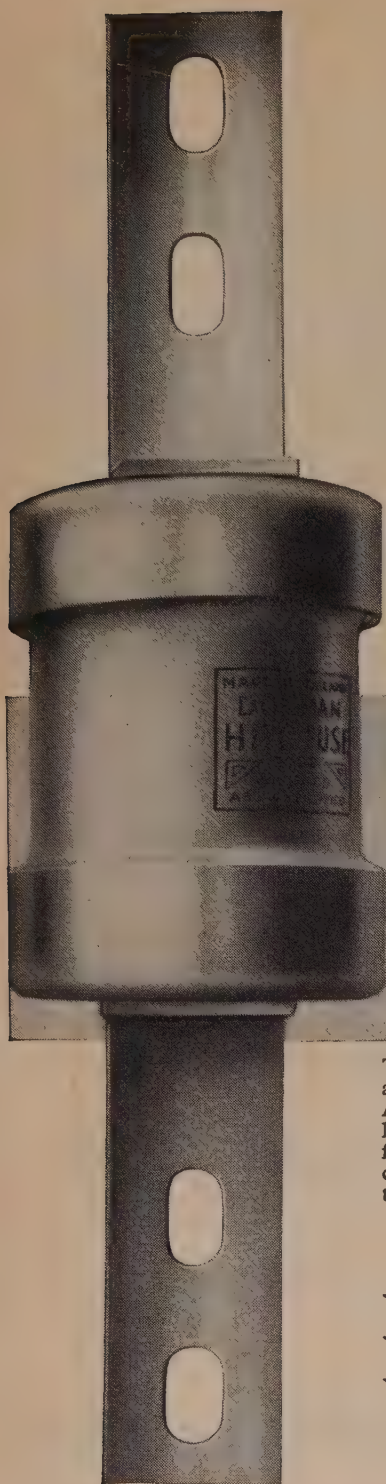
For information on the Unistrut system in fluorescent lighting trunking and other electrical applications, please write to:-
UNISTRUT DIVISION OF SANKEY-SHELDON LTD.



43/45 Broadwater Road, Welwyn Garden City, Herts. Tel: Welwyn Garden City 6321 (4 lines)



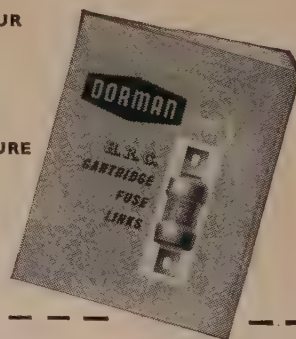
TYPE 'Q' H.R.C. cartridge fuse links up to 800 amp. rating



The Dorman type 'Q' H.R.C. Cartridge Fuse Link has been designed and developed with a view to achieving a fusing efficiency hitherto unknown. It has been subjected to stringent tests by the Association of Short-Circuit Testing Authorities, in accordance with B.S.88, 1952, Clause 8 and having passed such tests successfully has received A.S.T.A. Certificates for ratings up to 800 amp. for category of duty 440v. In actual performance the fuse link remains cool when carrying its full load, and due to the special construction of the element is consistent in operation.

- ★ For Category of Duty 440v. A.C.5.
- ★ A.S.T.A. Certified to B.S.88 (1952).
- ★ Advanced Technical Design gives high efficiency under all conditions.

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To Dorman & Smith Ltd., Preston, Lancashire.

Please send latest Dorman type 'Q' H.R.C. Cartridge Fuse Link Catalogue.

NAME.....

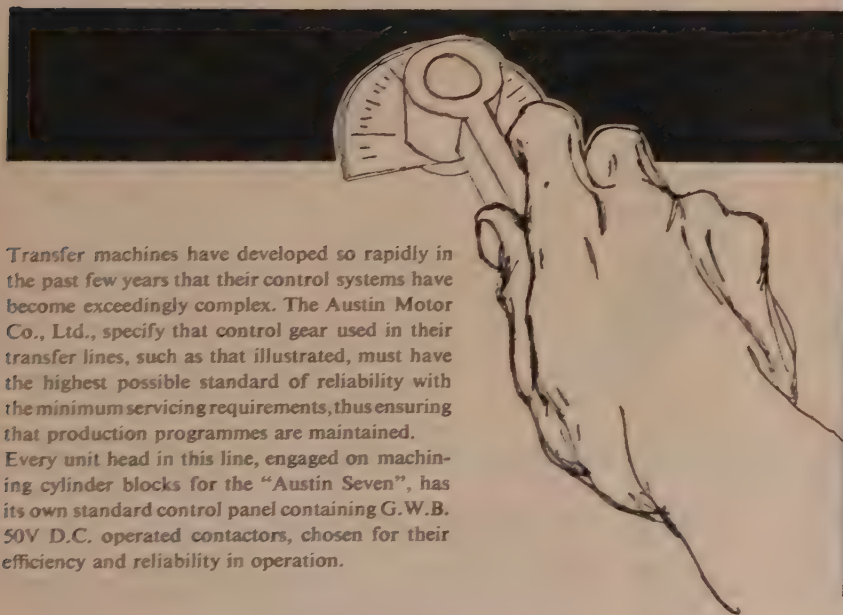
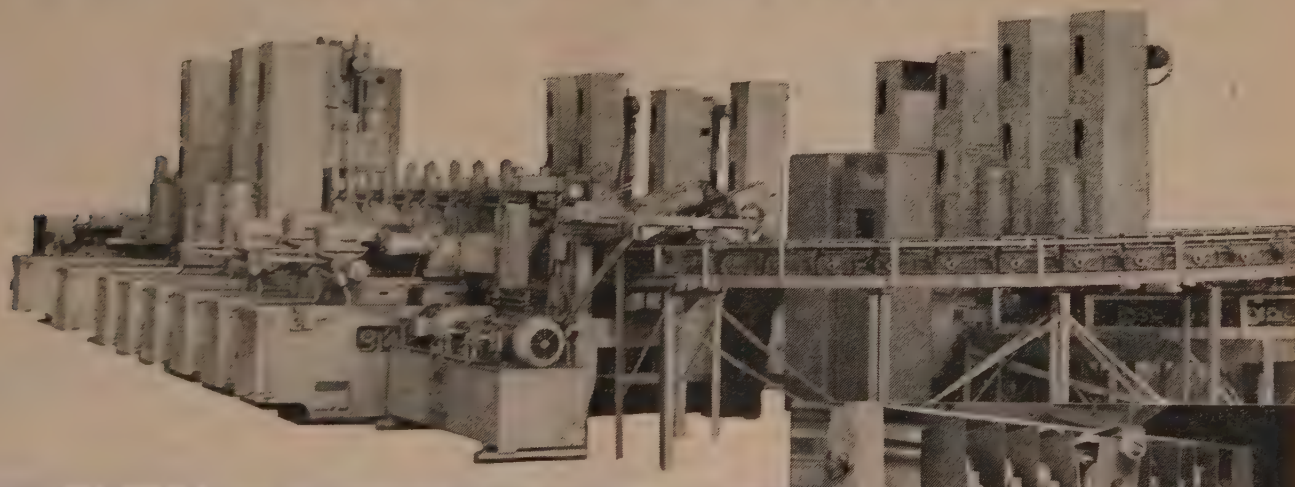
POSITION.....

FIRM

ER/4/11/60

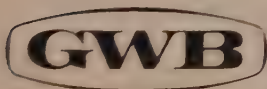
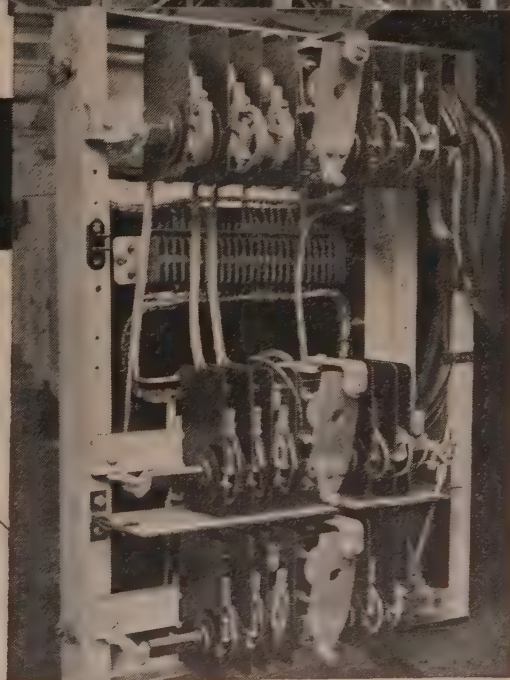
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USE G.W.B. CONTROL GEAR



Transfer machines have developed so rapidly in the past few years that their control systems have become exceedingly complex. The Austin Motor Co., Ltd., specify that control gear used in their transfer lines, such as that illustrated, must have the highest possible standard of reliability with the minimum servicing requirements, thus ensuring that production programmes are maintained.

Every unit head in this line, engaged on machining cylinder blocks for the "Austin Seven", has its own standard control panel containing G.W.B. 50V D.C. operated contactors, chosen for their efficiency and reliability in operation.



G.W.B. FURNACES LIMITED (CONTROL GEAR DIVISION)

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ASSOCIATED WITH: GIBBONS BROS. LTD. & WILD-BARFIELD ELECTRIC FURNACES LTD.



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Paxtons

Parts in all types of Bakelite, Glass Laminates, Mica,
Fibre, Ebonite, Leatheroid, Asbestos and other materials
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PAXTONS (ELECTRICAL) LTD. WESTON-SUPER-MARE

AID & ARB APPROVED

TEL. 1357

Where is the chimney?

"I like your design for this office building. It's very good. But isn't it to have central heating; where is the chimney?"

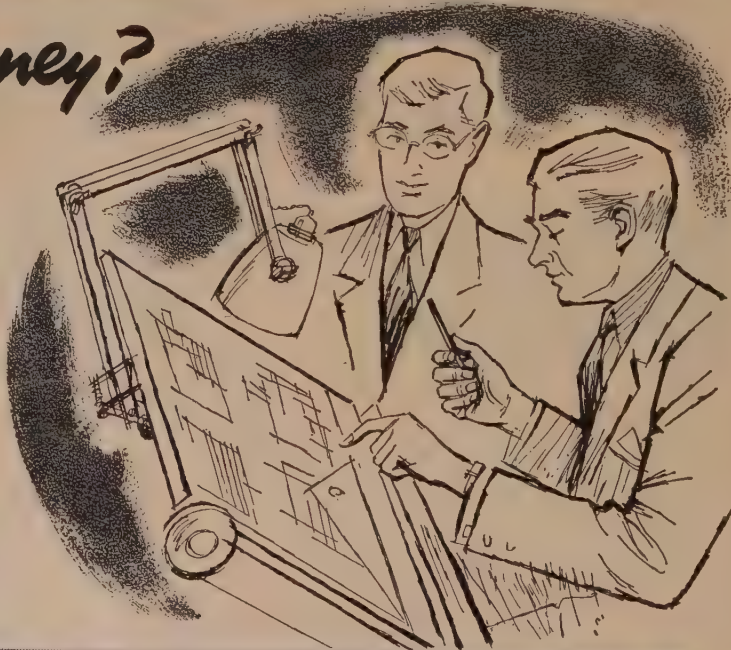
"There is no need for a chimney in this building, sir. You see it's being heated by electricity, using a B & A electrode boiler and thermal storage."

"What about costs. Is it expensive to run?"

"Not at all. Power is taken overnight at cheap off-peak rates. What is more, these boilers being electric have remarkably close control systems. No more heat is put into the building than is absolutely necessary. That cuts out waste."

"It sounds very interesting. I'd like to know more about it."

"Why not get their hot-water boiler catalogue? It tells you all about the Bastian & Allen off-peak system for central heating and you will see some of the big new jobs where it is being used."



Fully automatic • Accurate controls
NO attendant needed • NO Boiler house
NO chimney • NO fuel storage
NO fumes or fire risk



BASTIAN & ALLEN ELECTRODE BOILERS

Write for Catalogue ER to:

BASTIAN & ALLEN LTD.

Ferndale Terrace, Harrow, Middlesex. Phone: HARrow 7171/6
Northern Office: 62 Robertson Street, Glasgow, C.2. (Central 7628)

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of advanced Electrical,
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Continuous loop core—improved magnetic performance.
Reduced iron and copper losses.
Low hot-spot temperature gradient.
High resistance to line surges.
Great short-circuit strength.

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The transformers are manufactured in a range of five sizes, viz., 5, 10, 15, 25 and 50 kVA and are designed for operating on a single-phase, 50 cycle, 11 kV or 6.6 kV supply.

OVERLOAD CAPACITY

The transformers are capable of withstanding the following overloads for two hours, without injurious heating, following continuous full load with an average ambient temperature not exceeding 20°C.

5 kVA	100%
10 kVA	45%
15 kVA	25%
25 kVA	15%
50 kVA	As B.S. 171 and C.P. 1010.

IMPULSE LEVEL

The H.V. windings are designed for the following impulse levels :—

6.6 kV	75 kV full wave.
11 kV	100 kV full wave.

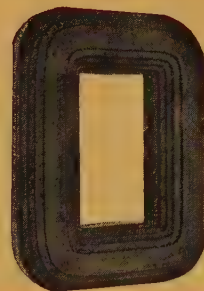
PERFORMANCE

	5 kVA	10 kVA	15 kVA	25 kVA	50 kVA
Magnetising Volt-Amperes (approx.)	30	45	60	90	150
Iron loss at normal voltage (watts)	22	38	49	70	125
Copper loss at normal rating 75°C. (watts)	170	300	420	630	1070

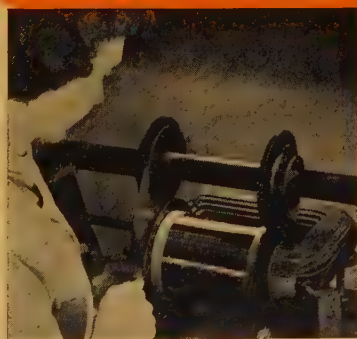
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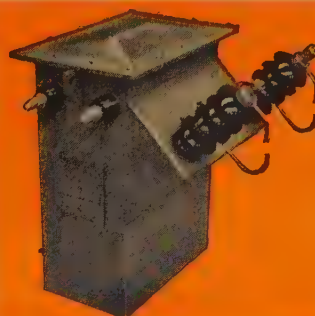
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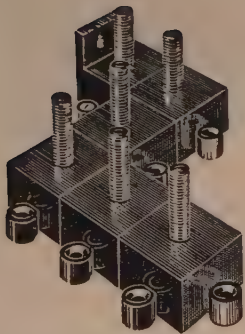
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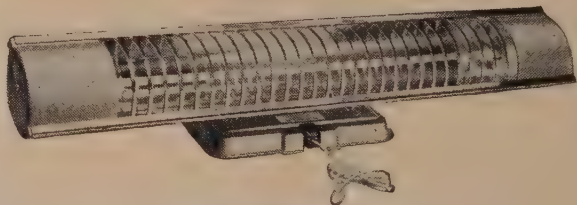
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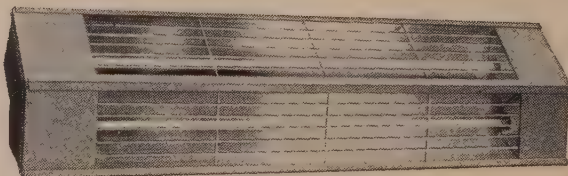
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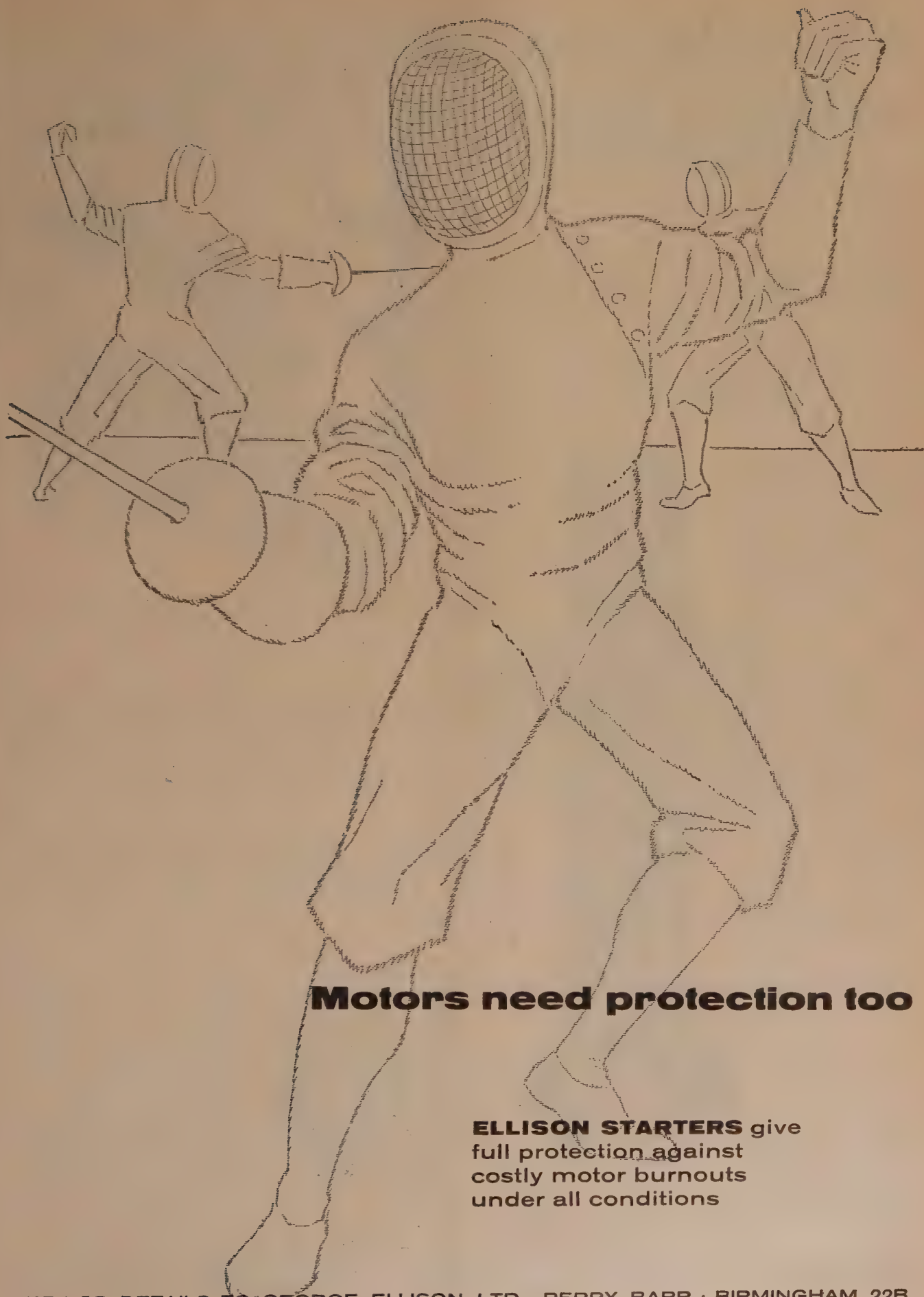
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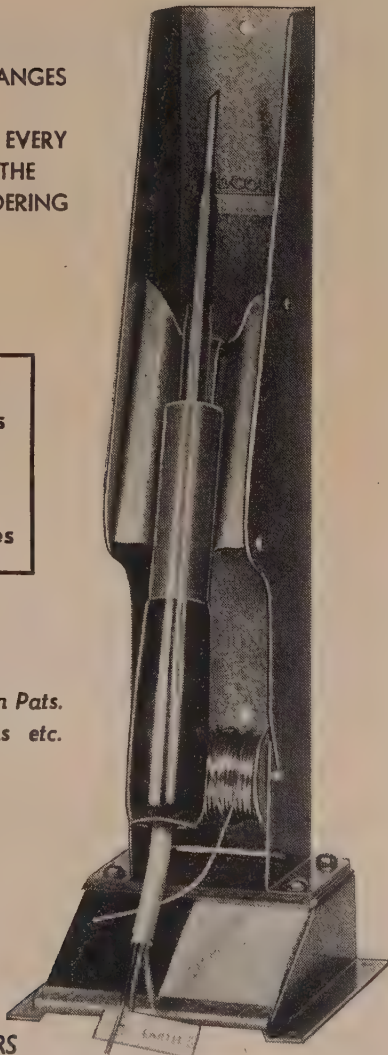
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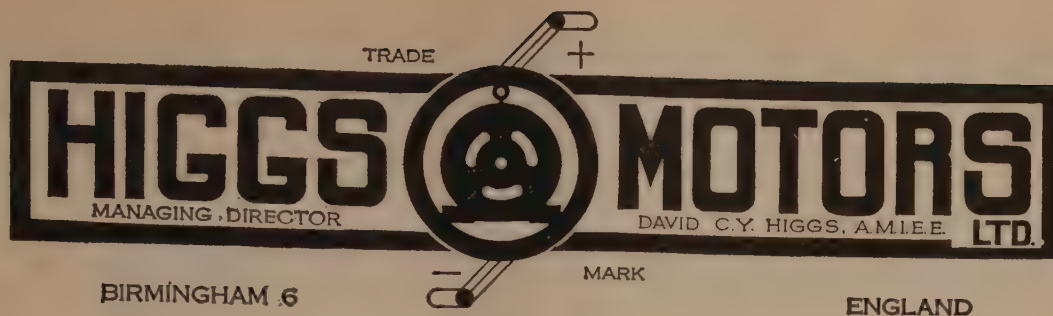
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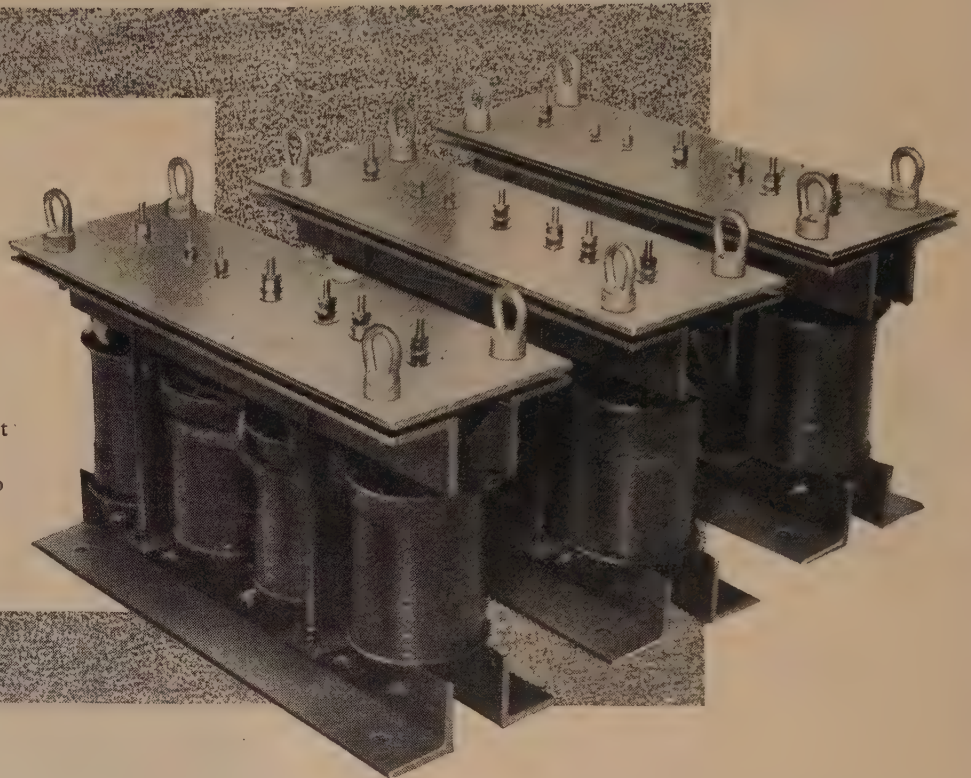
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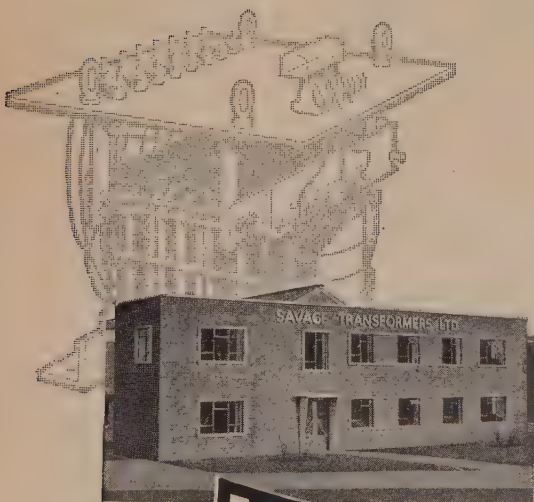
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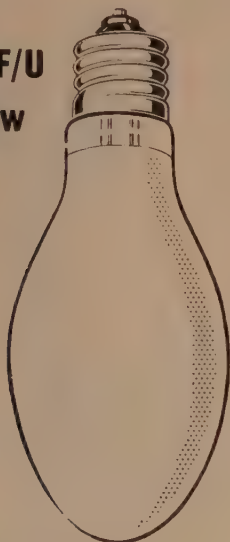
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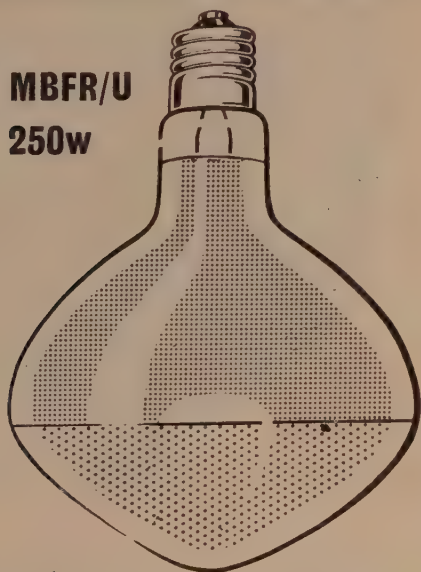


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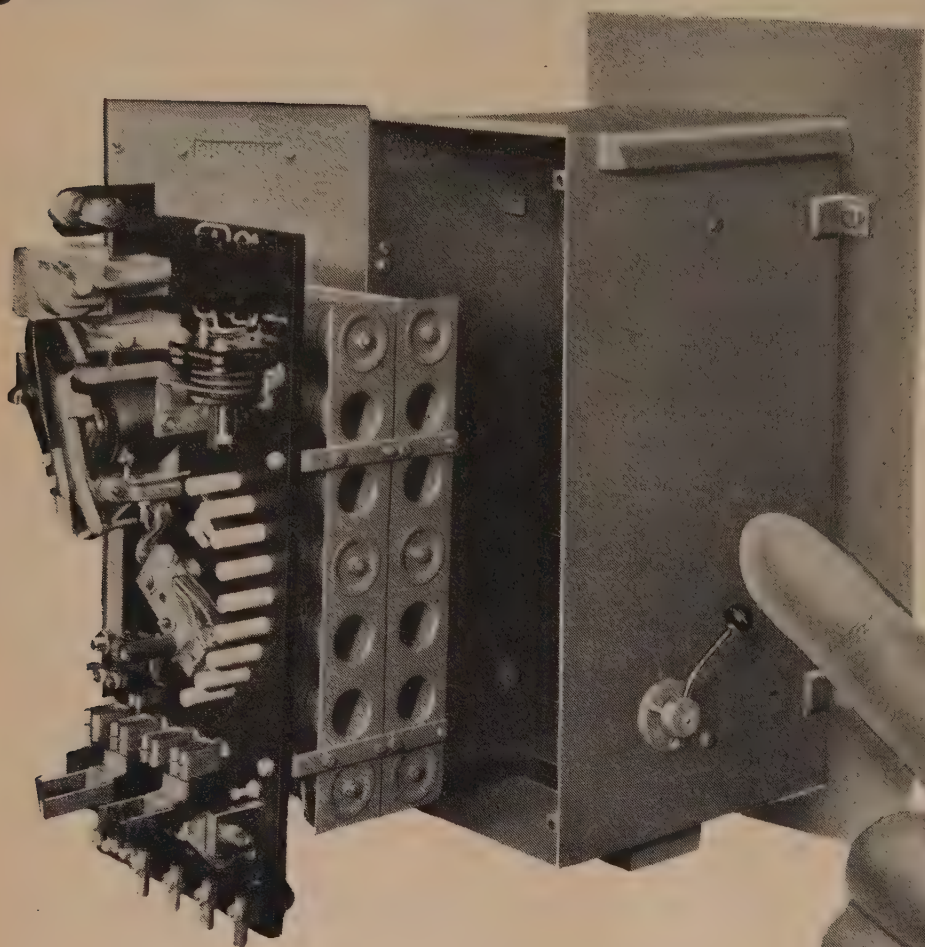


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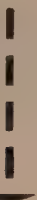
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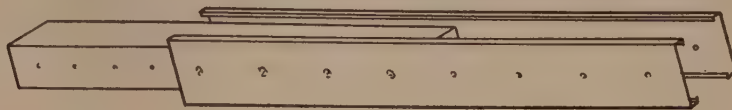
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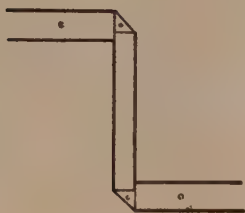
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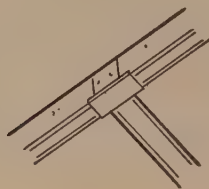
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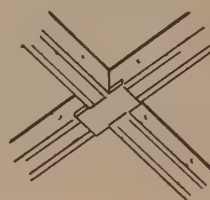
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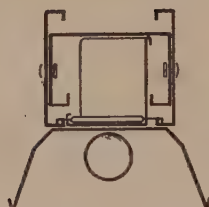
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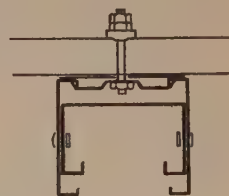
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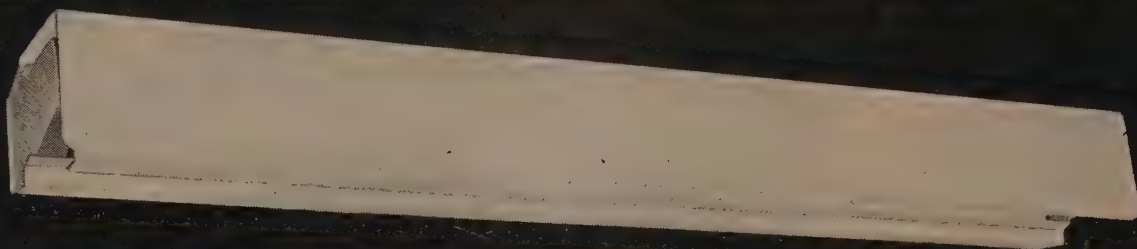


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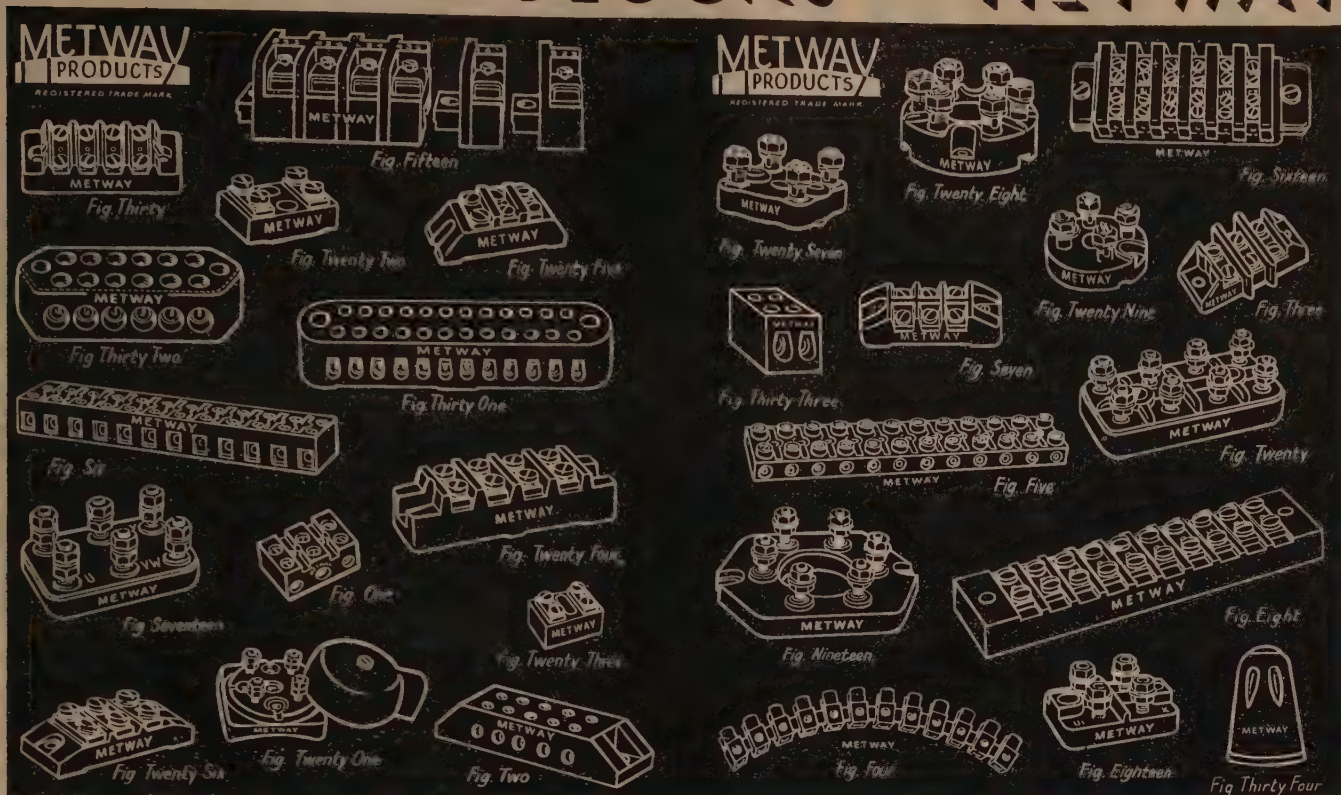
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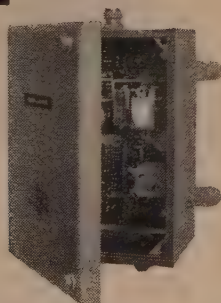


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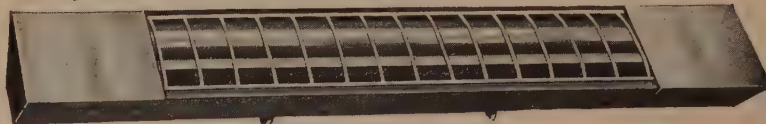
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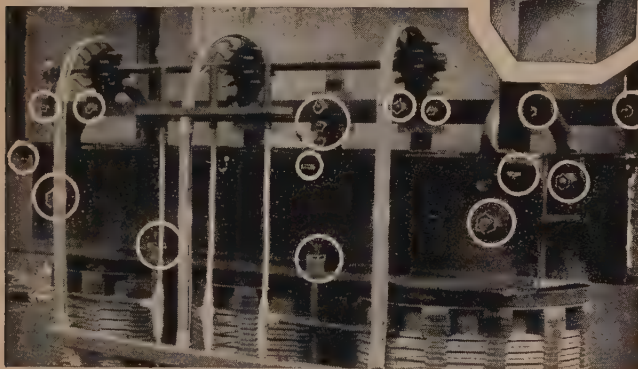
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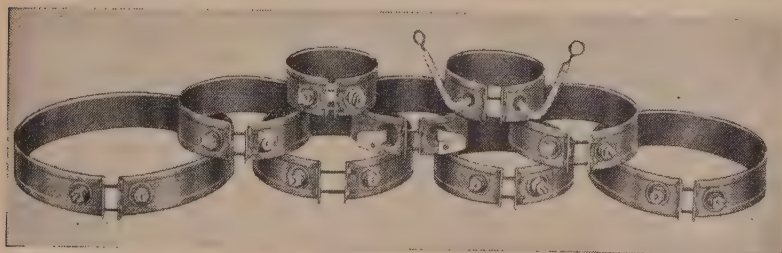
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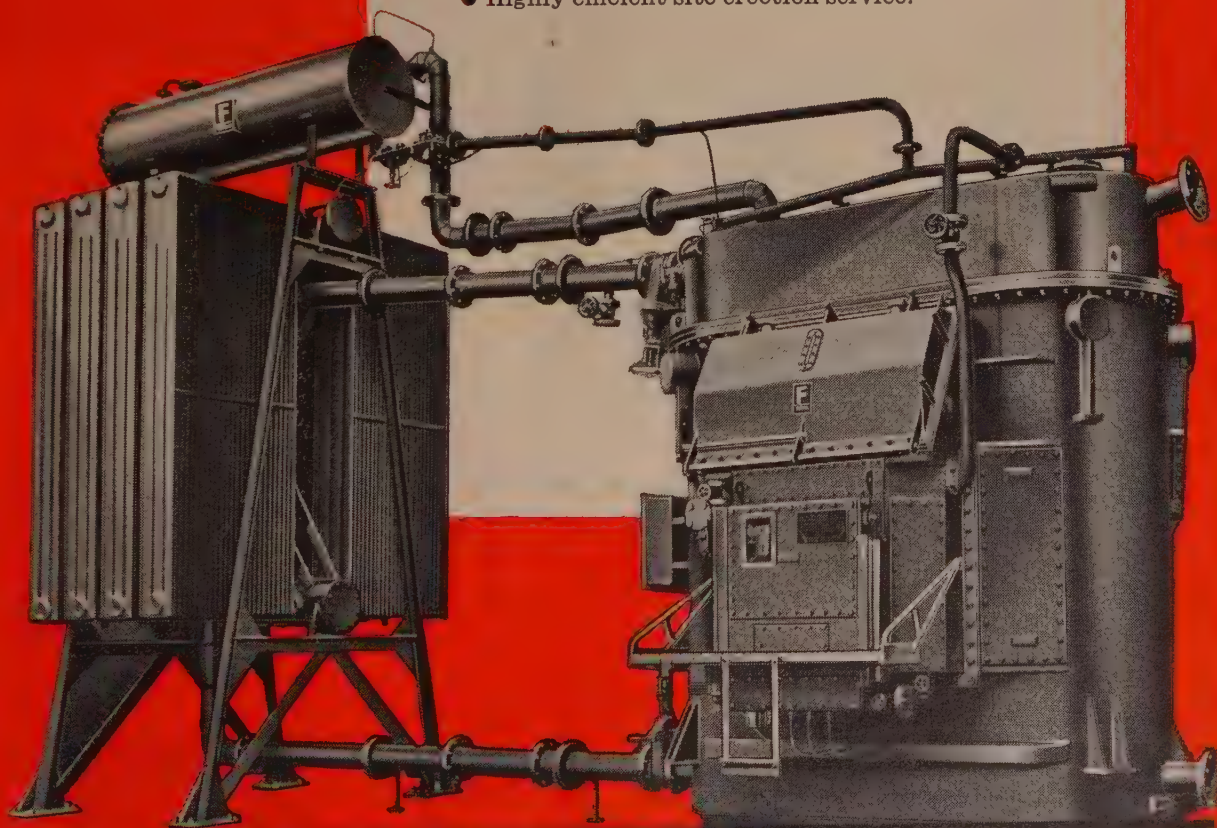
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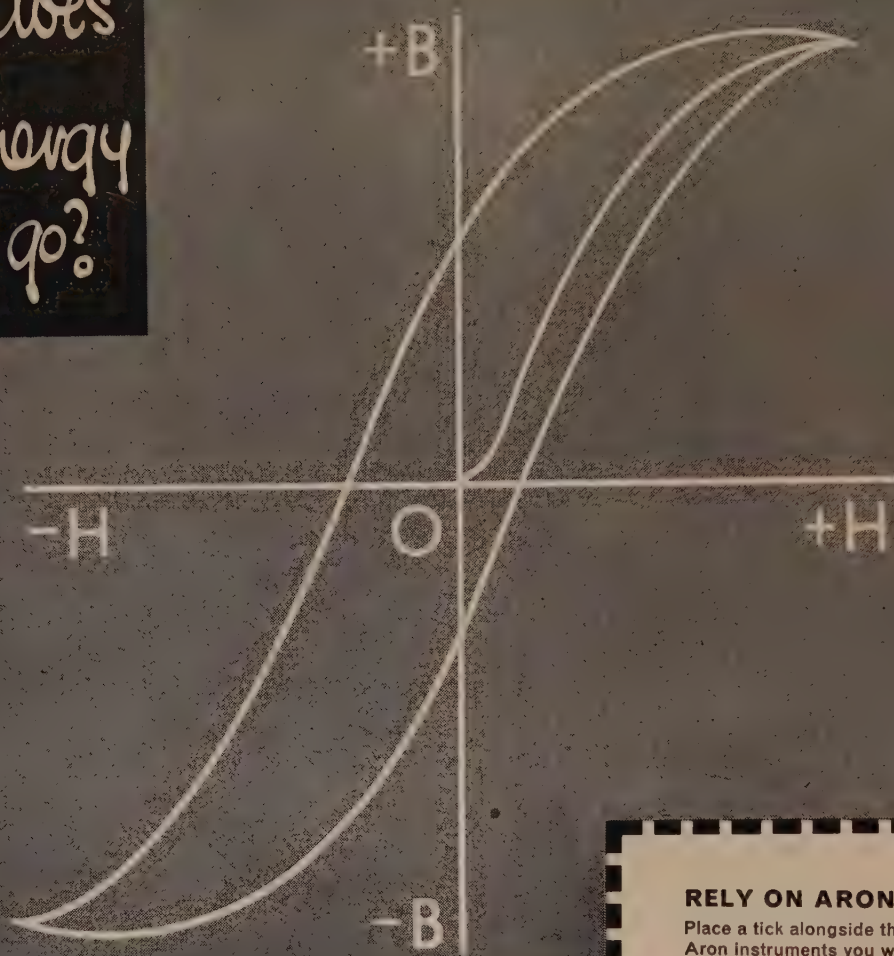
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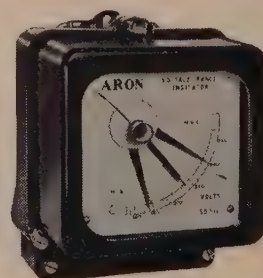
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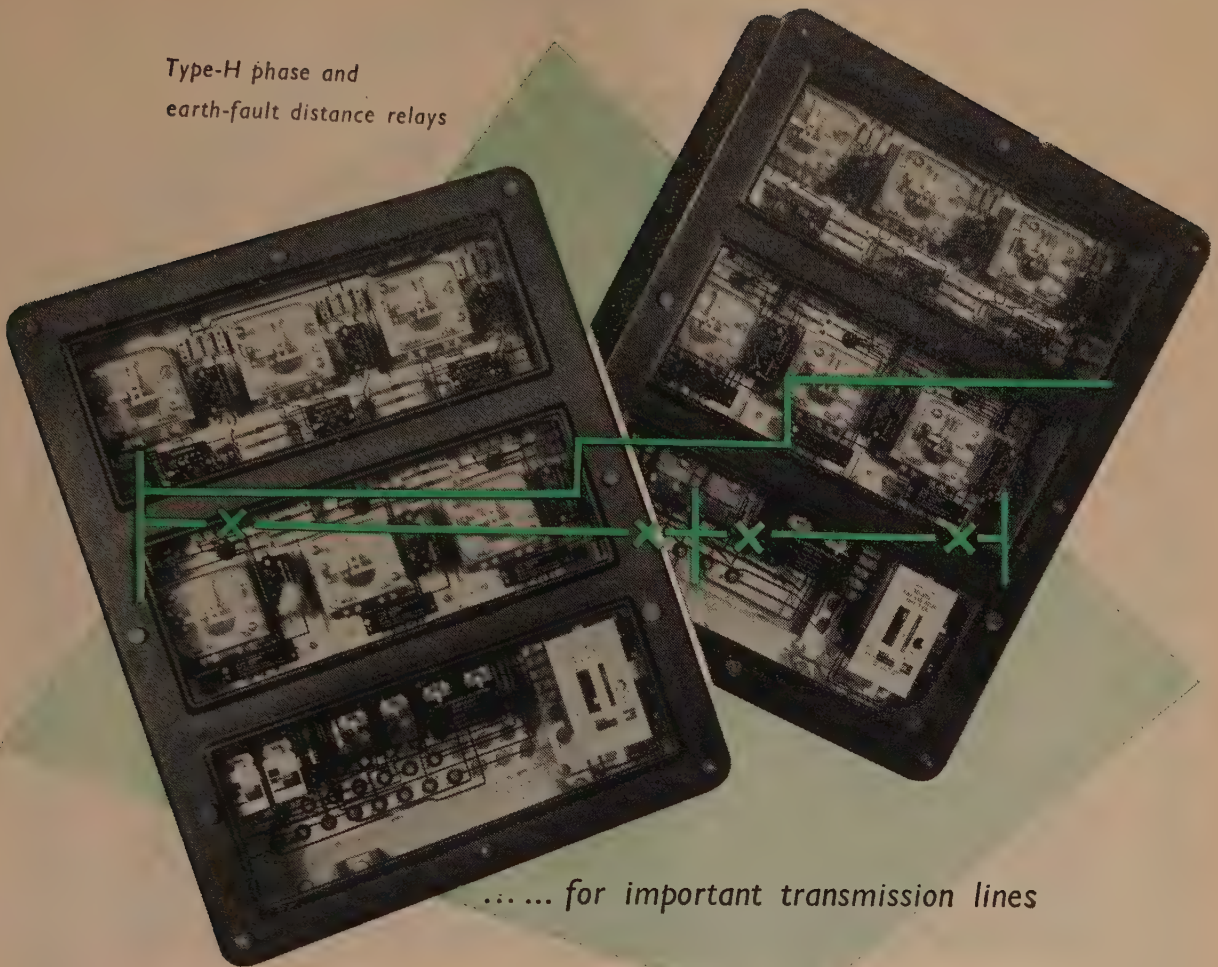
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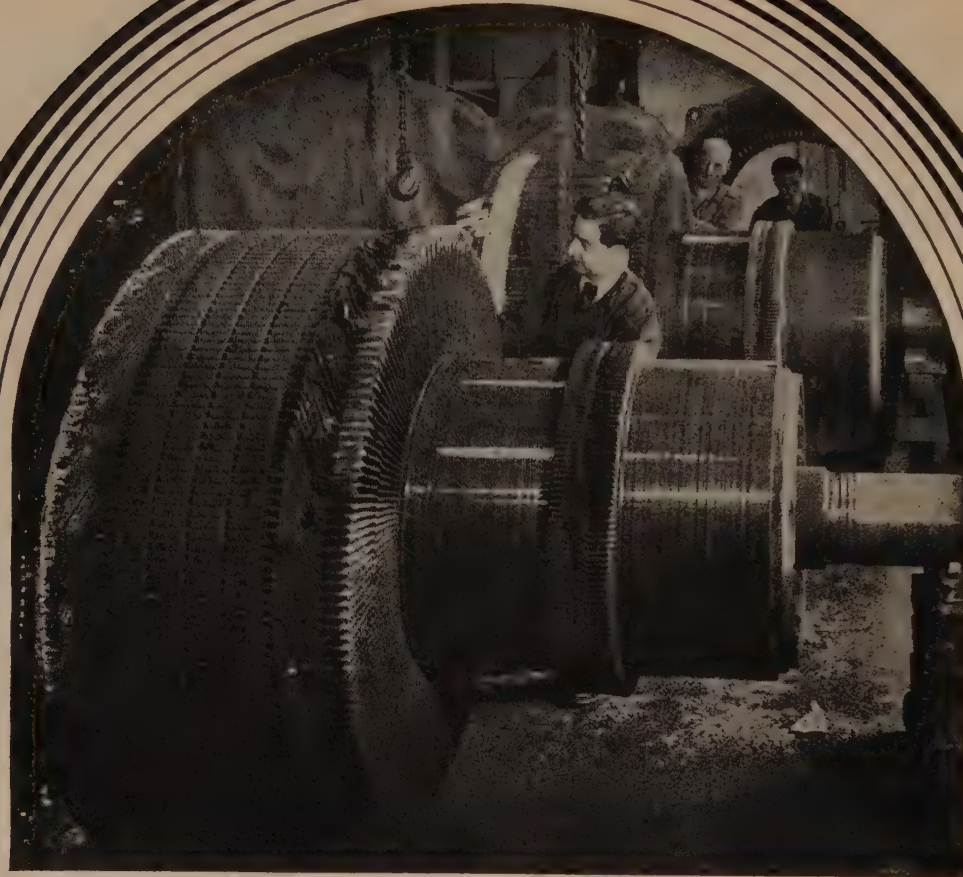
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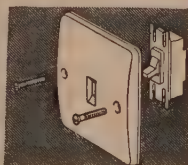
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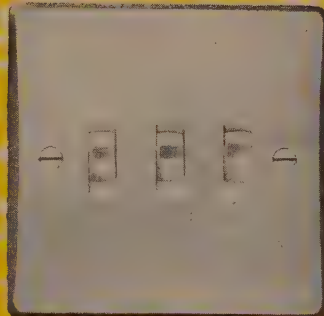
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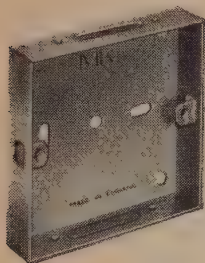


List No. 901—single entry cable clamp.

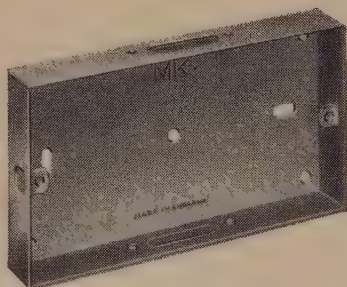
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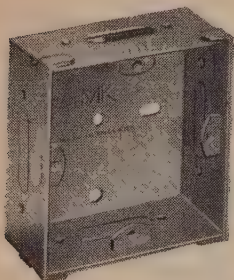
List No. 3951 — Plaster-depth box with $2\frac{3}{8}$ " fixing centres.



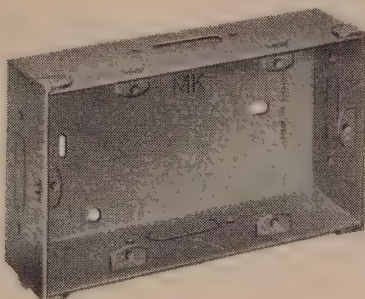
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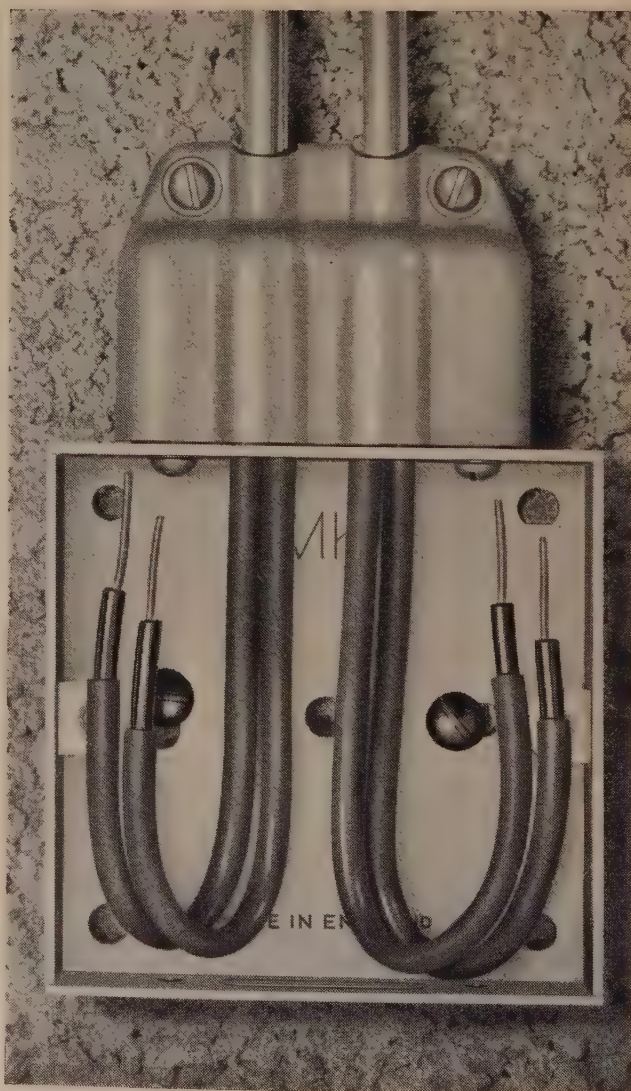
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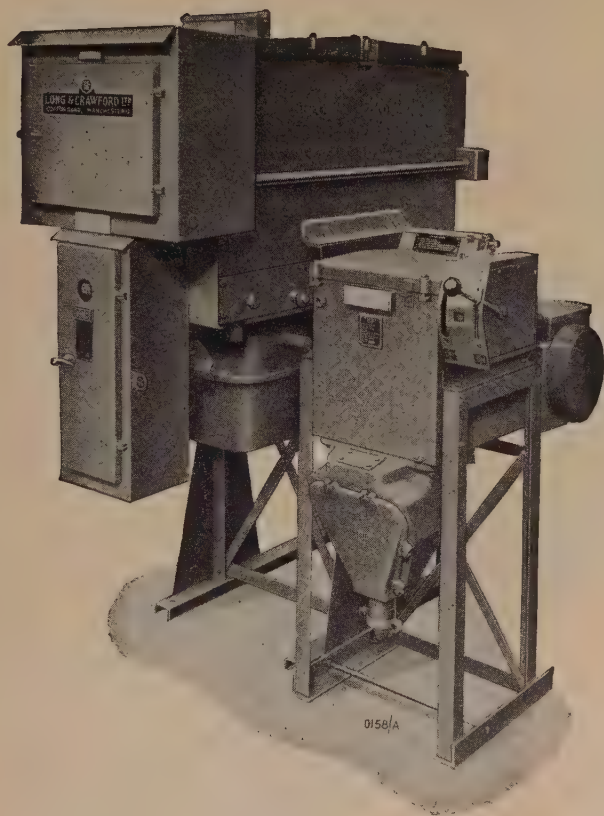
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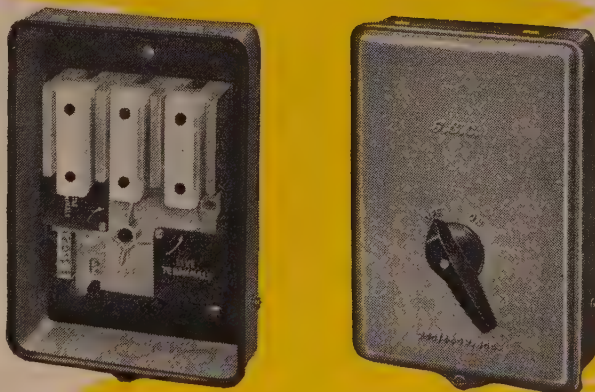
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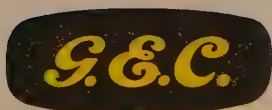
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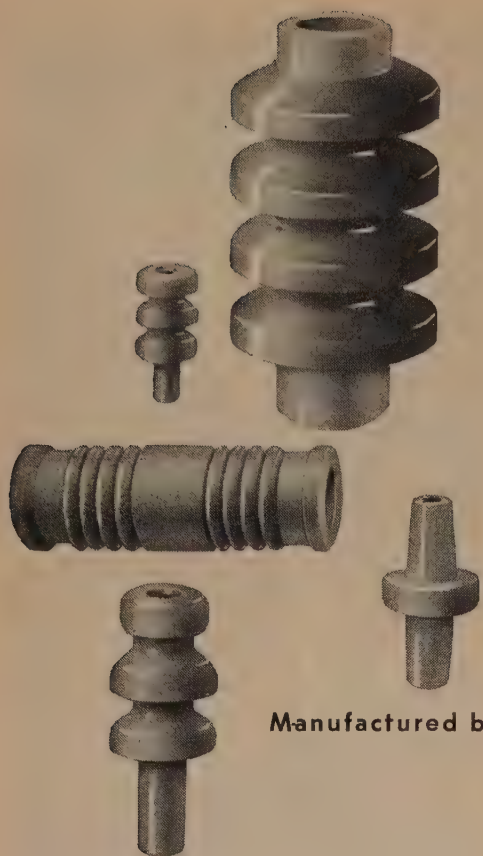
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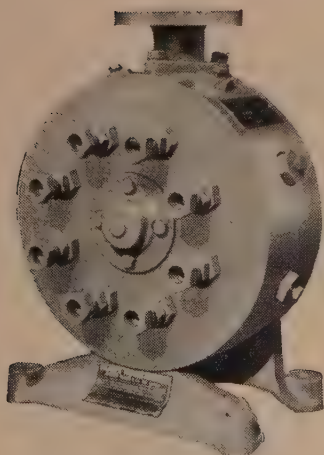
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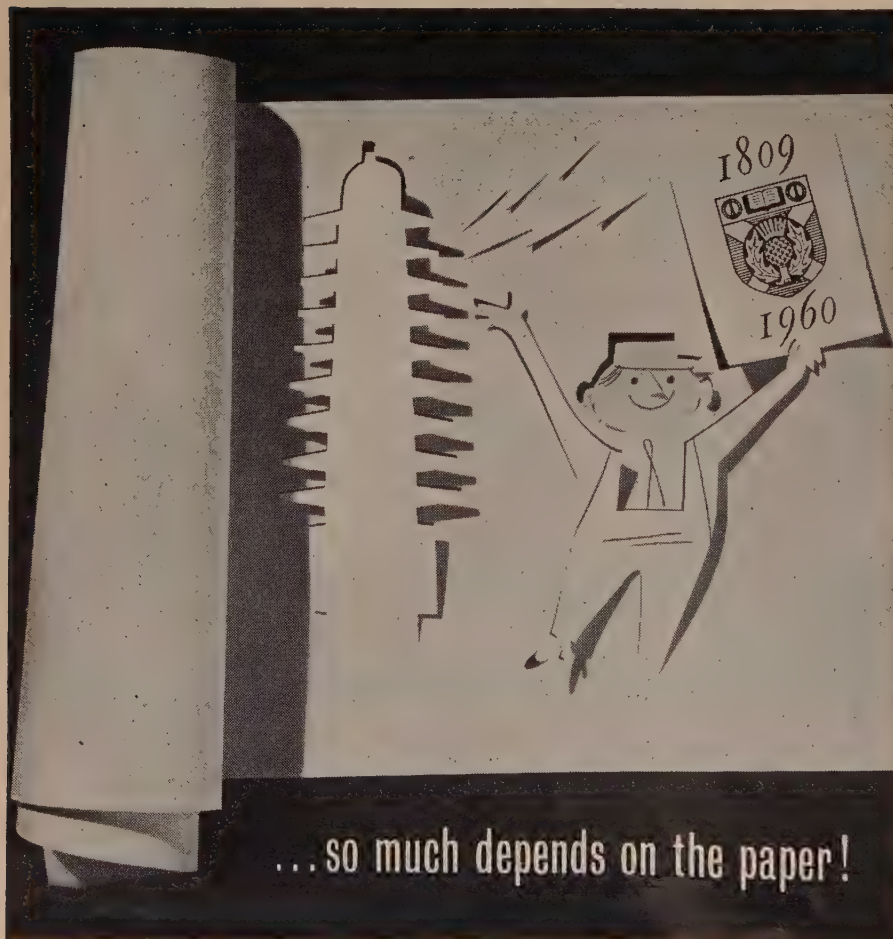
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1960

ELECTRICAL REVIEW

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Technical Editor:
A. R. POLLARD, A.M.I.E.E.

IN THIS ISSUE

Railway Electrification Doubts	765	Changing transport conditions have necessitated fresh thoughts on railway modernisation and last week it was announced that expenditure in 1961 was to be cut by £20 million. This may mean serious curtailment of the present plans for electrification
Glasgow Suburban Electrification	767	Description of the electrified Glasgow-Airdrie-Helensburgh system of 52 route-miles. The new service is to be officially inaugurated tomorrow (Saturday) by Sir Brian Robertson, chairman of the British Transport Commission
Silicones for Electrical Insulation	771	Survey of the various types of rigid and flexible silicone insulations currently available and their typical applications
Load Control	774	A review of two recent papers which discuss the scope for the use of load control in improving the efficiency of industrial consumption and the operations of the Electricity Boards
Fluorescent Control Gear Manufacture	777	Recent extensions at the Atlas Lighting factory at Spennymoor make this one of the largest plants of its kind in Europe. Production increases of 300-400 per cent have been achieved in the last five years
Fuel for Bradwell	779	The first fuel elements are now arriving at the Bradwell nuclear power station in Essex and No. 1 reactor will shortly become operational
Pipework for Nuclear Reactors	782	At the Tollcross (Glasgow) works of Stewarts & Lloyds, Ltd., components for nuclear reactors are made in the "clean conditions" shop
Industry and the House	783	Commentary on last week's debate in the House of Commons on the railway modernisation programme
◇ ◇ ◇ ◇		
Measuring Techniques and Automation	769	Financial Section 798
Faraday House Dinner	776	New Patents 802
Letters to the Editor	780	West Germany's Electrical Industry 803
Views on the News	781	Next Week's Events 805
New Electrical Equipment	785	Contract Information 806
Industrial News	788	CLASSIFIED ADVERTISEMENTS 99
Personal and Social	795	INDEX TO ADVERTISERS 114

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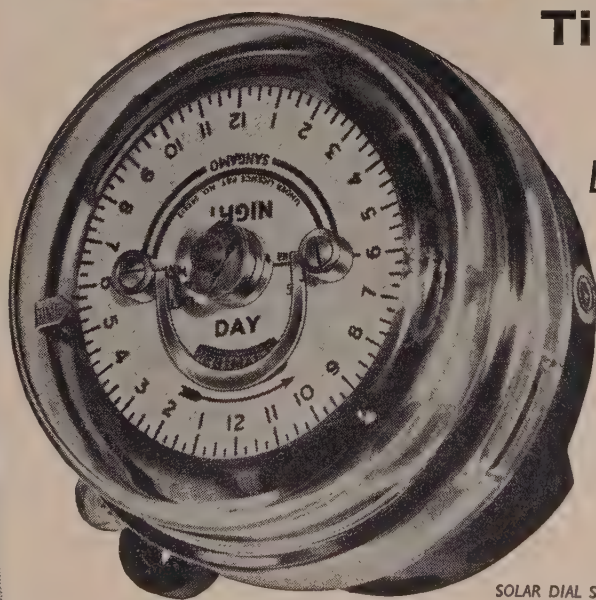
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ELECTRICAL REVIEW

4 November 1960 Vol. 167 No. 19 Established 1872

Railway Electrification Doubts

OVER the past few years a great deal of money has been spent on the modernisation of British Railways. The results are now increasingly apparent, particularly with the electrification work, and it is discouraging, to say the least, that the Government should have chosen this time to apply the brake. In the House of Commons last week the Minister of Transport announced that investment in the railways in 1961 would be reduced by £20 million from the originally agreed figure of £160 million and that a committee had been formed under his chairmanship "to consider what sort of and how big a railway system we need."

There is no doubt that the railways are in trouble. In 1959 their gross receipts were £457 million and the true deficit was £110 million. A major item in this, of course, is interest charges on capital. If borrowings between now and 1965 are at a rate of about £100 million yearly, by 1965 the interest charges will have risen by about £30 million. In addition, the growth of alternative forms of transport must be considered. Private cars, for example, have increased in number by over 30 per cent in the past three years. Rail-borne freight traffic this summer was over 14 per cent lower than in 1957 while road traffic was about 25 per cent more. Road transport now accounts for nearly 60 per cent of the total.

It is against hard facts such as these that the new committee's decisions will be taken. Mr. Marples announced last week that the British Transport Commission was represented and is co-operating in preparing a revised plan, details of which will be presented in a White Paper. As the Select Committee report showed, serious doubt now exists as to the full financial justification of some of the schemes in the present plan and it is likely that the revised plan will be reduced in a number of aspects. One of these is the electrification of the London Midland Region line from Euston to Manchester and Crewe. Although no details are yet available, it is known that the B.T.C. has reassessed the scheme "in the light of experience elsewhere" and "recent development" and this is being examined by the Ministry of Transport. Until a decision by the Ministry is made no further contracts will be placed. Existing contracts will, however, be completed. Present progress amounts to completion of the Manchester-Crewe section and a considerable proportion of the work between Liverpool and Crewe. Contracts for the remaining work on this part of the line have been

placed and electrified services will presumably be started as planned. No outside contracts have yet been placed for electrification south of Crewe, but some preparatory work has been undertaken by the railway's staff in the course of track renewal and signalling improvements.

To abandon the scheme at this stage would render the two small electrified sections virtually ineffective in relation to the whole of the main line. They would produce additional suburban traffic for Manchester and Liverpool, and in this connection it must be remembered that following the extension of the electrification in Kent passenger traffic has increased by 36 per cent. But if electrification of the Manchester and Liverpool lines only had been intended it is probable that economics would have dictated a low voltage third-rail d.c. system and subsequent assessment of the a.c. method based on experience on these lines may well be excessively unfavourable. Since the modernisation plan was conceived, conditions have changed considerably, affecting not only the choice of electrification system (always a thorny subject) but also the effectiveness of railway transport. To persist with a costly and little-used service would obviously be wrong, but where the need for a railway exists the system should be as advanced as modern technology will allow. The lines between London, Birmingham, Manchester and Liverpool, three of the major centres in this country, are obviously necessary and to stop the electrification at this half-way stage would surely be the grossest folly.

EXPORT CREDITS AND CO-OPERATION

The improved facilities which the Export Credits Guarantee Department are now able to offer are a welcome sign that the Government is prepared to back with tangible help its exhortations to manufacturers to export more. Even where their prices have been lower, British firms have sometimes lost contracts because foreign competitors have offered better credit terms. But Lord Chandos in his presidential address to the Institute of Directors last week pointed out that the difficulty of extending longer credits was now giving way to the problem of the availability of bank credits at medium terms. The Government's problem "is that the volume of these medium term credits cannot be expanded at the same time that a credit squeeze and enforced liquidity on the banks is applied."

Talking more generally on what he agreed was a "threadbare" subject, Lord Chandos emphasised that Britain's export performance "fell far short of what could be done." The Government could help by having a more stable policy with regard to purchase tax and hire-purchase and by pledging themselves not to alter the rates for, say, three years, except in a real emergency (B.E.A.M.A. have made a similar recommendation). Management must recognise that "inefficient handling of materials, ageing plant, and short-term profits at the expense of necessary replace-

ments spelt death to exports." Employees must "grasp that Britain could not for long pay for equal skill at higher prices than her competitors."

There was also the cost and risk involved in entering an overseas market—a larger firm might spend £20,000 in mere exploration—but here, Lord Chandos suggested, there was scope for a combined approach by smaller firms. The co-operative exhibit which the B.E.A.M.A. is organising for the Cologne Fair is one example of what can be done. But in view of the energy with which the Domestic Appliances Division has tackled the question of exports during the past year, the small number of firms supporting this venture is disappointing.

REACTOR CONTROL

It often seems to us that there are many opportunities for misconceptions in the "precise" language of science. As a particular example, it might appear to the non-specialist that the control engineer in charge of a nuclear reactor would take account of load variations by varying the positions of the "control" rods. This is not so because when a reactor is in operation the core is normally kept at its correct temperature by varying the mass flow of coolant gas, whereas the control rods are used when starting up and shutting down. Selected control rods in different parts of the reactor are also used to ensure a uniform temperature over the cross-section of the core and to maintain the reactivity level constant as the fuel becomes depleted.

Variable-pitch guide vanes at the inlet to the circulators for the advanced gas-cooled reactor at Wind-scale will be used to control the gas flow. At Bradwell, the control system which is employed to obtain a constant temperature/load characteristic is based on variable-speed coolant gas circulators. For each of the two reactors, a variable frequency turbo-generator will supply power for the six circulator induction motors, each of which drives a heat exchanger gas blower.

MERGERS AGAIN

The proposed merger of Pye and E. K. Cole focuses attention once again on the immediate difficulties of the manufacturers of domestic television sets. The negotiations had, however, been going on for many months and the real significance of the merger is that it takes a step further the concentration of the radio and electronics industry into a few and bigger units. Electronics has been the most dynamic section of the electrical industry in recent years and some of the technical and commercial achievements have undoubtedly been due to the relatively small size and specialisation of many of the firms engaged. The trend is now inevitably towards an increasing consolidation of interests through amalgamation and the capital goods side of electronic manufacturers' output is of growing importance.

The electrification of 52 route-miles comprising 114 single-track miles on the Glasgow-Airdrie-Helensburgh railway lines is now complete, and tomorrow (Saturday) Sir Brian Robertson, chairman of the British Transport Commission, will formally inaugurate the new electric service



Electric train on a trial run approaching Craigendoran Station

Glasgow Suburban Electrification

THE electrification at 25 kV a.c. of the Glasgow suburban railway system is on the former L.N.E.R. lines along the north side of the River Clyde between Airdrie and Helensburgh via Singer and Yoker, including the Milngavie and Balloch branches, and lines to Springburn and Bridgeton Central. For engineering reasons a diversion was made to the former L.M.S.R. line at Dungglass between Bowling and Dumbarton where the two lines run close together. A new system of colour light signalling has been installed throughout.

At 119 road and rail overbridges and footbridges on the route of the north side of the River Clyde the requisite clearance for the overhead electrical equipment was not available and planning was based on reconstruction at

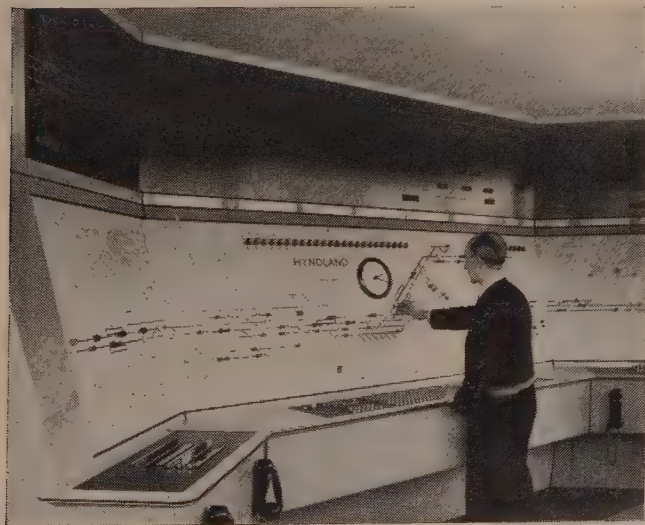
65 sites, raising of the superstructure at 19, removal at seven, and track lowering at 28.

The civil engineering costs involved in providing the necessary electrical clearances for the standard 25 kV working would have been prohibitive in certain places particularly in the tunnel sections under the city, consequently the central area of the scheme was designed for operation at 6.25 kV. To provide the necessary electrical clearance for this voltage, track lowering has been necessary. On lines on the north side, simple catenary construction is used.

Overlap spans are situated at the ends of tension lengths in the overhead line equipment. Overlap spans are also located where a break in the overhead equipment is required for switching purposes. At a switching overlap the two equipments which terminate at the overlap are insulated from each other. At overlaps where there is no switching the two equipments are linked by a jumper and are electrically common. Neutral sections are installed where there is a change of voltage or a change of phase in the electrical supply. Neutral sections are switched so that the "dead" section can be made "live" at the voltage or phase of the section ahead in the event of a train coming to a stop with its pantograph on the "dead" section.

The overhead line is divided into sections at neutral sections, overlaps, section insulators, and insulated knuckles. The sections can be connected by outdoor switches. These switches are mostly hand operated by a handle rotating a torque rod which in turn rotates the switch blade. Motorised switches are employed at neutral sections and certain remote locations. These are controlled remotely from the control station.

Power supplies are taken at 25 kV, single-phase, 50 c/s from the electricity authority network through duplicate



Hyndland signal box—interior showing signalman at control panel

In addition, ten track sectioning cabins are situated at intervals along the line.

Single-pole single-phase oil circuit-breakers controlling the incoming and outgoing supplies at feeder and sub-feeder stations are provided. These are solenoid operated; balanced pilot protection and overload protection is provided on the circuit-breakers controlling the power cables, while the oil circuit-breakers controlling the tracks are equipped with distance impedance protection.

The electrical control station for the area has been sited at Cathcart. The centre is a clean, functional building, and the 30ft long mimic diagram of the power supply system is capable of further expansion. The control station and equipment are designed in halves, so that if either half were out of commission the other could carry on and maintain supplies and control until reinstatement was effected. The mimic diagram displays each oil circuit-breaker and overhead line motorised switch position, a key enabling each position to be operated and

continuously recorded. In addition, alarm indications, meter readings and telephone facilities are available on a desk in the control room. Altogether, thirty-three sections are indicated in the diagram.

The rolling stock is made up of three-coach units consisting of one driving trailer coach, one non-driving motor coach and one battery-driving trailer coach; two or three units may be coupled together to form six- or nine-coach trains. The individual coaches of each unit are not separated in service and are coupled with two air hoses, one control jumper cable and one heating and lighting jumper cable. Units are coupled together by a buckeye coupling, one control jumper cable, and two air hoses.

The coaches are of saloon type and have air-operated sliding passenger doors electrically controlled by push-button boxes in any guard's compartment. At the outer end of each unit, on the battery-driving trailer and driving trailer coaches, is a driving compartment, and at one end of the motor coach is a guard's compartment.

Measuring Techniques and Automation

International Congress and Exhibition at Dusseldorf

FROM A CORRESPONDENT

THE second International Congress and Exhibition for Instrumentation and Automation—Interkama—was held at Dusseldorf in the Federal German Republic from 19th to 26th October. Specialists of all industries were afforded an opportunity to acquaint themselves with the present state of instrument and control engineering, and with modern methods of automation applicable to their own respective manufacturing plants and processes.

This year's event consisted of a very large exhibition, a congress proper with a full programme of lectures given by specialists from a variety of countries, and instrument courses organised by individual manufacturers to describe in detail the design characteristics and maintenance of selected types of instruments or control gear of their own make. Since 1957, the organisation had been both streamlined by the exclusion of all interests not immediately connected with control and automation, and increased in respect of floor space to some 400,000 sq. ft, number of exhibitors to nearly 500 and the number of firms holding instrument courses to about 50; the scope of the congress itself was also increased and a total of 42 papers were read.

Non-German exhibitors numbered 188, that is nearly 40 per cent of the total, and amongst these the United Kingdom held pride of place with 46 firms, followed by France (40), Switzerland (31), the U.S.A. (29) and Italy (18). Regrettably, however, the impact of the British exhibitors, largely grouped in a co-operative stand organised by the Scientific Instrument Manufacturers' Association, in no way reflected their number nor did it do credit to the excellent instruments shown. The exhibit was compressed into a relatively small box-like framework of yellow-painted raw timber with an arti-

ficially low ceiling of gauze in an otherwise lofty hall and the individual exhibitors were compressed into little cubicles. By contrast, the French collective stand, barely a few feet away, although perhaps technically less interesting, was spacious, open, inviting and almost always well attended. A number of British firms exhibited outside the collective stand to better effect. Not unexpectedly the exhibition was permeated by the influence of the United States. This was caused partly by American firms exhibiting directly, and partly due to such firms having either established manufacturing facilities in Europe or entered into manufacturing or sales arrangements with German or other European firms. Very noticeable, too, was the Swiss industry.

It is impossible in a short article to convey more than a general impression of the exhibition and to do more than list at random a few of the truly formidable number of equipments displayed which covered all aspects of industrial life. As regards general trends, one could say that two factors are outstanding: the spread of the transistor and the magnetic tape, with the real impact of the latter still to come. Electronic computers and calculators have by now ceased to make headline news, although their field of application is still widening. Thus, for instance, a relatively small and reasonably-priced computer is offered which is claimed to allow a power station at all times to be operated at the optimum thermal efficiency obtainable under the given conditions; no such computer is at present in use, at least not in Europe, but two Continental electricity supply undertakings are said to be considering its purchase. Automatic control of weights on an industrial scale was demonstrated amongst others for the loading of lorries, where a simple unit is

installed beneath a roller of the loading conveyor belt which, together with an integrating counter, stops the belt when the load has reached, for instance, carrying capacity of the lorry. For foundry or steelworks use, a weighing apparatus was shown incorporated in the carrier of a ladle which not only indicated on a digital counter the total weight discharged at any given time of the cycle, but also the actual rate of discharge in tons per minute.

At the other end of the scale of sizes, a surface electron microscope was demonstrated particularly designed for metallurgical application where the specimen is bombarded with electrons and a direct image of the surface is obtained through the secondary electrons released from the specimen, thus eliminating the necessity for replicas or other expedients.

Again, on the operational rather than the laboratory scale, an instrument was shown indicating on a cathode-ray screen not only the eccentricity of turbine shafts, but of individual wheels and even damage to, or vibrations of, single turbine blades which can be identified whilst the turbine is running. Although this supervisory control must be incorporated in the turbine in the design stage, it should make welcome news now that very large units are on the way.

Transistorised Switchboard

An exhibit which attracted very much attention and comment was a compact fully transistorised switchboard and control desk for the remote control of two—or, if appropriately extended, more—electricity supply sub-stations from a central point, complete with mimic diagram, telemetering, re-check of the code signal and pre-monitoring to prevent faulty operations. It was developed jointly by the Swiss and German branches of Brown Boveri and is based on a pulse-code system incorporating digital electronic functional units.

Portable high accuracy contact temperature and humidity measuring instruments with thin long probes on handles have been designed, both on the resistance and on the thermocouple principles which provide full indication within two to three seconds in the case of temperatures of -30°C to $+300^{\circ}\text{C}$ and humidity from 0 to 100 per cent in approximately the same time. Another electric thermometer shown is able to measure temperatures from 250°C upwards at a distance of 1 to 3ft without contact; it is based on American design and employs semiconductors. Yet another of the many thermometers shown is one for a range of -200° to $+600^{\circ}\text{C}$ in five steps for a total of 24 measuring points (selected by numbered pressbuttons) which may be up to five miles distant; response time is one second for full-scale deflection. Also amongst the smaller electrical measuring instruments displayed was a dynamometer switchboard frequency meter, measuring some 4 by 4in, for a full-scale range of 49.8 to 50.2 c/s, and direct application of 110 to 380 V, with uniform scale divisions of 0.01 c/s, and by the same firm a portable universal measuring instrument for ten different electric values—from volts to $\cos \phi$ —operating on any frequency between 45 and 10,000 c/s; it weighs under 6 lb and is said to be virtually shockproof.

The 42 papers presented at the congress, largely by well-known authors from various countries, were

arranged in five groups, namely, response characteristics and actuators, new components used in measuring systems, systems of measurement, control and data handling, optimising control and data handling in control systems of a higher order, and problems of instrument design. Among the British contributors were Professor J. F. Coales, of Cambridge, who spoke on the use of statistics in the design of control systems, Dr. A. C. Menzies on the subject of flame photometry in absorption and emission, Mr. D. H. Desty on progress in the technology and application of gas chromatography, Mr. J. Jardine on data logging and its application in automatic process control and Professor J. Loxham on the potentialities of accurate measurement and control in production engineering. Other authors included M. Cahen, of Electricité de France, who dealt with the response of the controlled system and the actuators in frequency and power control of electricity supply systems.

Symbols, Signs and Abbreviations

THE British Standards Institution has decided to make a comprehensive revision of Part 1 (General) of B.S. 1991, "Letter Symbols, Signs and Abbreviations." Since four further parts will be issued in 1961, however, an amendment to Part 1 (obtainable as PD 3920) has been issued. It brings into effect the more important modifications which are necessary to avoid inconsistency between the various parts. Copies of this amendment are available free of charge from the Institution at 2, Park Street, London, W.1, to all those holding copies of B.S. 1991. Two points of interest in the amendment are the use of the letter "f" to distinguish between the pound as a unit of mass and the weight of a pound under standard gravity as a unit of force, i.e. "lb" for pound mass and "lbf" for pound-force; and the decision that symbolic abbreviations for units should not carry a full stop as part of an abbreviation, e.g. the recommended abbreviations for horsepower and British thermal unit should be written "hp" and "Btu."

Electric Floor Warming

TWO years ago the Electrical Floor Warming Association was formed with the object of maintaining the highest possible standards of underfloor heating practice. Most of the manufacturers in this field are members and a regular series of monthly business meetings is held in addition to bi-monthly technical discussions with specialists in associated industries. A discussion meeting was held last week, when a panel, including architects and representatives from the British Electrical Research Association, the Cement and Concrete Association, the Cement Marketing Co., Ltd., and John Laing & Sons, Ltd., gave their views on some aspects of concrete floors in relation to floor warming systems. In the chair for the evening was Mr. R. F. Weaire, who has been re-elected to serve a second term of office as the Association's chairman. Previous subjects for discussion have included fault location in floor heating systems, controls and thermostats, design aspects and floor finishes. Full details of the Association can be obtained from its London address, 83/86, Saffron Hill, E.C.1.

SILICONES

for Electrical Insulation

By

G. FITZGERALD-LEE

One of the most interesting recent developments in electrical insulation has been the increasing use of organic silicones. These are chemically related to inorganic glass and mica but are available in the forms of fluids, resins, elastomers and greases. The various forms of rigid and flexible insulation embodying silicones that are currently available, and some of their typical applications, are surveyed in this article

ORGANIC silicones are related to inorganic glass and mica in that their structure includes alternate atoms of silicon and oxygen, but the variety of silicones includes fluids, resins, elastomers and greases, all of which have excellent electrical properties. They are comparatively inert chemically and are highly water repellent. Such materials are resistant to tracking and do not readily char to form conducting films. When disintegrated by continuous exposure to high temperatures, the insulator silica is produced instead of organic products. Silicones withstand temperatures of over 200°C for long periods—machines insulated with silicone-bonded materials have, in fact, been operated at winding temperatures above 300°C. B.S. 2757 classifies electrical insulating materials according to the maximum temperatures which they

will withstand in continuous service: Class F includes organic-modified silicone resins for use up to 155°C, Class H silicone resins and elastomers for use up to 180°C, and Class C silicone resins possessing superior thermal stability up to 225°C.

Experience over the last twelve years in the use of

tion in spite of the high operating temperatures often involved. Such insulating materials, including laminates, have a low power factor over a wide frequency and temperature range, sleeving is free from sulphur and does not affect silvered contacts, and the material is not affected by soldering.

There are several forms of flexible silicone-varnished insulation. High electric strength and moisture resistance can be obtained by applying several coats of a flexible silicone varnish to form a continuous film on glasscloth or tape. The glasscloth is an inert base material with good strength and heat stability and the resulting thermal endurance of the varnish is shown in Fig. 1. The glasscloth in this case was 0.007 in thick and the life indicated is based on the hours necessary to reduce the electric strength of varnished glasscloth to half its initial value. Typical properties of 3 mil base glasscloth are an electric strength in volts per mil of 1,000 using 1½ in diameter electrodes and measured at 90°C after ageing for 12 hr at 300°C, a permittivity of 3.4 at 100°C and a frequency of 50 c/s, 0.01 power factor at 100°C and 50 c/s, and water absorption after 24-hr immersion of 0.5-1 per cent.

Such glasscloth and tape is used for sheet insulation in high-temperature applications such as insulation in motors, generators, dry-type transformers and electronic equipment, and earth insulation on induction heater coils and power cables. The glasscloth can be used as low-voltage slot insulation, but the usual crazing and reduction in electric strength may occur due to creasing and a combination of high pressure and temperature could cause the resin to flow and when it is used in high-voltage machines the glasscloth should contain a layer of mica splittings.

Silicone-varnished glass sleeving is made from continuous-filament glass fibres which are saturated or varnished with a flexible silicone resin. When heavily varnished, giving an average breakdown of about 4 kV/mil, this sleeving is used for lead wires and connections when maximum electrical strength is required, the saturated sleeving being used for low-voltage insulation or as a covering which will later be impregnated with varnish. Silastomer silicone rubber-coated glass sleeving, mentioned later, has the same heat stability but is more flexible. For tying or binding in electrical equip-

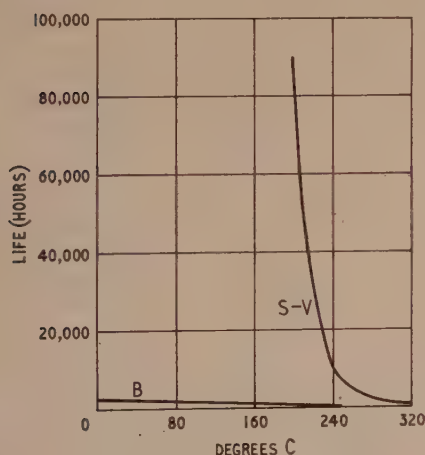


Fig. 1.—Thermal endurance of silicone-varnished glasscloth compared with Class B insulation

silicone insulation for traction motors, large dry-type distribution transformers, electromagnets and power cables has shown that silicones greatly prolong the service life of electrical machines working under adverse conditions, they give greater freedom from overload failures and reduce fire hazards, and through redesigning for, or rewinding with, silicone insulation, the power/weight ratio is increased. In electronics, silicone insulation permits parts to be beneficially redesigned for miniaturisa-

ment working at high temperature, silicone-treated tying cord is available. This high tensile cord is made of continuous-filament glass fibres and the varnish treatment prevents fraying, improves knot holding and increases the resistance to abrasion.

Silicone-bonded mica and mica/glass are available in four forms, silicone varnishes being particularly suitable for bonding mica; such insulation is very flexible and

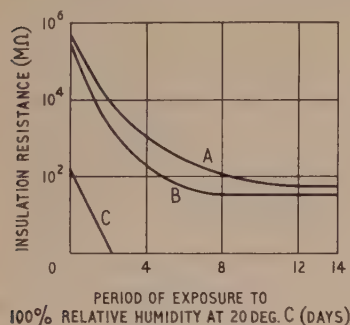


Fig. 2.—The effect of humidity on the insulation resistance of cement-bonded hard asbestos board ("Sindanyo") (Test methods based on B.S. 1137, appendix H)

Curve A: Phenolic paper laminate B.S. 1137, Type I

Curve B: Silicone resin impregnated natural "Sindanyo"

Curve C: Untreated natural "Sindanyo"

suited to layer insulation in transformers. When heat resistance and space are limiting factors, silicone-bonded mica sheeting or tape are preferable due to the high electric strength, heat stability and flexibility. Mica/glass tapes consist of up to three layers of mica reinforced with woven glass. A single layer, the most flexible, is 0.004in thick, two layers 0.006in and three layers, the least flexible, 0.008in thick. Mica/glass sheet, which is micanite reinforced with woven glasscloth, is available in sheets 35in by 40in, the thicknesses of one, two or three layers being as for the tapes, and flexible micanite is supplied in sheets 40in square and up to 0.0625in thick. A useful slot insulation is provided by glass/mica/glass sheet 35in by 40in about 0.015in thick according to whether there are two or three layers of mica. The sheet is of silicone-bonded mica splittings between sheets of silicone-varnished glasscloth.

Asbestos paper can also be included in the laminates. Combined with silicone varnish, high electrical grade asbestos paper, from 0.003in thick, has good insulation and physical properties and can be used either as a wire wrapping or as a layer insulation. Even after six months' ageing at 200°C, followed by conditioning at high humidity, the material retains good electric strength. Although asbestos paper has low breaking and tear strength, this can be rectified by a silicone varnish-bonded backing of thin, open-weave glasscloth. Material 0.015in thick has an electric strength of more than 400 V/mil, which is retained on a sharp bend when the asbestos paper is in compression, the silicone resin bond giving the desired amount of flexibility and thermal endurance.

Rigid Insulation

Silicone resin-bonded rigid insulation may also take any one of several forms, such materials being made from woven glasscloth bonded under heat and pressure with a silicone resin. Silicone/glass laminates have excellent dielectric properties over a wide frequency range as well as low water absorption, good arc resistance and heat stability up to 250°C. Because of their higher bond strength, laminates made of staple fibre cloth are easy to machine while those made with continuous filament glasscloth have better flexural strength and electrical properties. Such laminates are available as flat 40in by 20in sheets

up to 1in thick, as tubes or in special shapes. Tested according to B.S. 1137, the specific gravity of the material is 1.9, tensile strength 15,000-20,000 lb/in², flexural strength 20,000-35,000 lb/in², water absorption 0.1 per cent, power factor at 10⁶ c/s 0.001-0.003, permittivity at 10⁶ c/s 3.9, and electric strength of $\frac{1}{8}$ in thick specimens some 200 to 250 V/mil. These laminates retain high insulation resistance under humidity cycling and they are used for slot wedges, coil formers and as supporting or separating materials in electrical and electronic equipment.

The mechanical support given by silicone resin binders to mica and micanite is effective at much higher temperatures than the support given by organic varnishes and silicone-bonded mica and micanite have excellent moisture and arc resistance and low power factors. The silicone resins used may be either thermoplastic, and thus softenable under heat, or thermosetting. Hard micanite is available in sheets 23in by 35in up to $\frac{1}{8}$ in thick, and also as tubes. Silicone-bonded commutator insulation can also be obtained as either moulded end-rings or segment micanite (which should be ordered as separators cut to the required size).

Asbestos woven cloth impregnated with silicone resin is available in sheets and machinable rods and tubes for use up to 350°C, special electrical grades being suitable for motor slot wedges, heat space insulators and structural insulation. The surface treatment gives better resistance to tracking and reduced moisture absorption. Another form of silicone resin-bonded rigid insulation is silicone-impregnated asbestos board. To improve its dielectric properties—especially under wet conditions—cement-bonded hard asbestos board can be impregnated with a low viscosity silicone resin. Such improvement is compared in Fig. 2 with the resistance of a well-known phenolic paper laminate. Due to the cheapness, dielectric properties, thermal stability and high arc resistance of these products, their field of application is wide, including arc chutes, component parts of domestic heating appliances, the low-stressed sections of dry-type transformers and as substitutes for paper/phenolic boards when flame resistance is required. Silicone moulding compounds are available for the compression or transfer moulding of electrical components with low water absorption and good physical and dielectric properties after long service at up to 250°C.

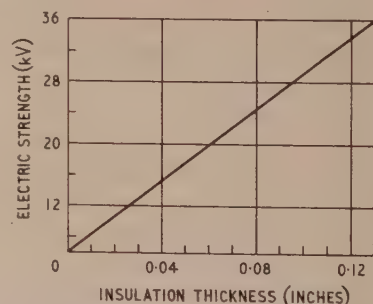


Fig. 3.—Electric strength of Silastomer coil wrappers

Flexible Materials

The flexible insulator known as silastomer is a silicone polymer made with heat-stable fillers and curing agents. It is heat stable over a much wider range of temperatures than natural rubber, resistant to oxidation and many chemicals and maintains its good dielectric properties over a wide range of temperatures and frequencies. It can be obtained in the form of pastes or

putty for filling compounds and as stocks for moulding, extruding and sheeting, and it can also be combined with glasscloth and asbestos. When tape in the form of a layer of semi-cured silastomer on one side of glasscloth is cured by heating, it forms a homogeneous, resilient, moisture-proof and oil-resistant coating. The resultant cloth or tape remains resilient and rubbery after thousands of hours at up to 200°C; it neither cracks nor crazes and has excellent resistance to mechanical and electrical fatigue. Owing to their thermal conductivity, silastomer coils can carry 20 per cent more load than coils insulated with mica and glass, bonded and impregnated with the best electrical insulating varnishes—and still operate at the same temperatures. Such coated cloth has an electric strength using $\frac{1}{4}$ in electrodes of 500 V/mil; permittivity at 100 c/s of 3.8; power factor at 100 c/s of 0.01; and surface resistivity of $10^{12} \Omega$. Available in thicknesses of from 0.005 in, as a pressure-sensitive semi-cured material, it is used to wrap field, armature and transformer coils. Fully cured silastomer/glasscloth laminates up to $\frac{1}{4}$ in thick are used for washers and gaskets.

For coating woven fabrics by solvent dispersion, a special grade of silastomer has been developed, available in thicknesses from 0.004 in. It is resistant to temperatures from 55 to 250°C and to abrasion and it has low water absorption with good retention of physical strength and electric properties after flexing. Coated glasscloth 0.01 in thick has an initial electric strength of over 1,000 V/mil, which shows no decrease after nine days at 250°C. The electric strength of silastomer-coated glasscloth and tape is shown in Fig. 3, the values being measured on pressed bars using four long foil electrodes around the bar. The samples were pressed for ten minutes at 200°C and cured for four hours at 150°C. Glasscloth thus coated and cured can also be obtained with an extra coating of silicone pressure-sensitive adhesive to ease the wrapping of bars and coils. Fig. 4 shows the results obtained on immersing U-shaped bars insulated with half-lap tape of 10 mil thickness coated with 1 mil of silicone pressure-sensitive adhesive, the bars being cured for three hours at 250°C before the tests began.

When extreme flexibility is required, certain grades of silastomer are available which can be extruded and cured to form thin-walled sleeving which is elastic and has good resistance to abrasion and tear. Besides coating materials such as tape and glasscloth, solvent-free silastomer pastes are also available in various consistencies, for encapsulating and filling to exclude dirt and moisture and to minimise damage by vibration. Such pastes have good dielectric properties, heat endurance and high thermal conductivity, retaining their resilience at all temperatures and resisting weathering and oxidation. Some are cured at heat and others at room temperature—with the aid of a catalyst. These pastes are useful for filling voids around the lead wires of coils and motors, as a substitute for impregnating varnishes in solenoid coils and for other sealing or potting applications.

For silicone-insulated cable and wire, silicone enamel gives a coating serviceable up to 200°C, with good flexibility, scrape hardness and electric strength as well as excellent resistance to salt water and many solvents and oils. Silicone-bonded glass-covered wire is made with a double glass covering on copper, the glass being bonded to the wire with a special silicone varnish which gives a

tough surface highly resistant to abrasion. The breakdown voltage layer test results vary from 800 to 1,200 V for this material, the figures being the same after 24 hours at 250°C and the material is recommended for resistance to heat, moisture and corrosion. Several types of silicone-insulated conductors can be obtained, using combinations of silicone rubber, asbestos and glass braiding impregnated with silicone varnishes. Such wire and cable has excellent resistance to oxidation, ozone and water as well as good flexibility at low temperatures and excellent electrical properties after long exposure at 200°C—even operating through fires. Such conductors are recommended for motors, transformers, coils and cables operating at high ambient temperatures.

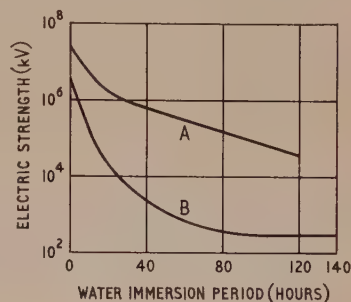
Heat-Stable Adhesives

Several heat-stable silicone adhesives have been developed for holding insulating components in position or during the fabrication of assemblies. For example, MS 840 is a silicone-bonded resin which is supplied as 80 per cent resin solids in acetone. It dries quickly and

Fig. 4.—Results obtained on water-immersed U-shaped bars insulated with half-lap tape of 10 mil thickness coated with 1 mil of silicone pressure-sensitive adhesive

Curve A: Tapes bonded with MS 2704 after ageing for 30 days at 250°C

Curve B: Tapes bonded with MS 2704 before ageing



forms a good bond and if it is then heated to about 225°C, a hard film with good bond strength results. MS 2704 is a pressure-sensitive adhesive which is available in solvent solution to be applied by knife or brush, dipping or spraying. It has good adhesion to metals, glass, organic plastics and silicone insulating materials and pressure-sensitive tapes thus treated are now available. Silastomer components can also be bonded together, or to metals or other silicone insulators, under heat and pressure with a silastomer bonding agent.

Films of silicone-impregnated varnishes which have been cured are very flexible and do not crack, craze or carbonise even after long exposure at 250°C. Such varnishes are highly water repellent and heat stable and can be applied by either vacuum impregnation or dipping. They are used to bond and impregnate coils, motors and transformers, or they can be applied to silicone-insulated equipment, giving insurance against burn-outs due to overloading, faulty conditions, moisture or chemicals.

These are some of the main electrical insulating materials made of silicone resins and elastomers with glass fibre, mica and asbestos. They vary from thin, flexible sheets and sleeving to rigid components over an inch thick and to wires and cables. They all have excellent thermal stability, low dielectric loss and other good electrical properties and can be used either singly or collectively for insulating electrical equipment varying from miniature electronic components and domestic appliances to large transformers, motors and switchgear.

The author is indebted to Midland Silicones, Ltd., for information on which this article is based.

LOAD CONTROL

Improving the Efficiency of Industrial Consumption

TO keep pace with the apparently inevitable annual rise in the demand for electric power the electricity supply authorities must maintain a very high level of capital expenditure. In England and Wales it is of the order of £300 million a year. The amount required would be considerably greater but for the technological advances that have made it possible to achieve a marked reduction in the cost per kilowatt of generating plant installed while at the same time increasing its efficiency of operation. Improvements to the transmission and distribution networks, and in control systems, have reduced losses and facilitated the siting of the most modern base-load stations on the coalfields. The result of these efforts by the industry on the production side has been that the rise in the price of electricity over the past 10 years has been much less (27 per cent against 48 per cent) than that of retail prices generally.

But though much has been achieved, investment on the present scale can only be justified if generating plant and the transmission and distribution networks are employed to their maximum capacity and if the electricity produced is efficiently used. Improvement in this direction is more difficult because it is not entirely in the hands of the Electricity Boards and the results of increasing the efficiency of consumption tend to be overshadowed by the overall rise in demand. Consumers, and particularly large industrial consumers, must be persuaded that they have a real interest in improving their load factor and power factor and those of the supply system.

It is a far cry from the days when a manufacturer might have to give the local station superintendent a period of notice before switching on a 4 to 5 MW arc furnace and the post-war days of load shedding are but a dark memory. But two engineers of the South Wales Board, Messrs. Jackson and Charles, have pointed out* that the "wheel of control has turned full cycle once again" and with the introduction of the new bulk supply tariff, with facility for disconnectable loads, "load control will become an increasingly important part of our commercial and engineering planning in the future development of our system."

Russian Experience

In a planned economy the organisation of consumption along the most economical lines, from the point of view both of the supply industry and the consumer, is obviously much easier than where the desired changes are a matter of free negotiation or of persuasion through tariffs. It is noteworthy therefore that in a new E.C.E. study† of experience in various countries in what is termed the "rationalisation of electric power consumption" the

majority of the examples are provided by Russia and the Eastern European countries.

For example, in Poland, Hungary, the U.S.S.R. and other People's Republics, inspection of industrial equipment is compulsory. Attention is directed to the specific consumption of electric power per unit of production, the load factor, the power factor and the extent to which these indices are affected by the organisation of labour, and the utilisation of different machines and methods of work. Sometimes, for the purposes of this inspection, the State Inspectorate enlists the help of scientific institutions specialising in the branch of industry concerned. On the basis of the results of this research, the State Inspectorate may require certain changes to be made in the plant or a reorganisation of work in the industrial undertaking concerned.

In Poland all industrial undertakings which are heavy consumers of electric power award bonuses to staff for savings in the consumption of electric power. These bonuses, which may amount to 30 per cent of the normal wage, represent a specified percentage of the actual electricity savings as calculated on the basis of the specific consumption per unit of production in the most recent years.

In the U.S.S.R., undertakings prepare each year a report on the modifications made in the organisation of their work and the technical measures taken to rationalise power consumption. These include particulars, in kWh, of the economies that can be achieved. Distribution of electric power in industry is undertaken according to a plan drawn up beforehand on the basis of specific consumption standards per unit of product. These standards are fixed each year by the Government, having regard to the development of and results achieved by certain undertakings. In addition, the Government organises an annual competition between industries in order to reduce specific power consumption.

The E.C.E. study, which is continuing, is concerned with four aspects of the rationalisation of consumption—the efficiency of use, the efficiency of machines and appliances, and the improvement of power factor and load factor—and this first report analyses replies from nineteen countries. A concluding comment is made that "many engineers in charge of industrial undertakings have insufficient knowledge of the economics of energy and there is a shortage of persons qualified to give advice in matters concerning the power economy of industrial undertakings."

Central Control in South Wales

Messrs. Jackson and Charles, in the paper already referred to, review the current practice in central control and deal briefly with the economic aspects of other methods of control.

They point out that the new central control centre at Pontypridd is for the primary purpose of maintaining

* "Control of Industrial Loads," by H. Jackson, B.Sc., M.I.Mech.E., M.I.E.E., and R. F. Charles, A.M.I.E.E. (E.D.A. Industrial Development Conference, 1960).

† *Rationalisation of Electric Power Consumption*. Economic Commission for Europe (Stationery Office, price 2s 6d).

continuity of supplies, but that paradoxically it also provides the means by which load control can be effected on an Area Board scale. An outstanding feature is the provision of telemetering which will permit minute-by-minute assessment of the total megawatt load consumption for the area, from 27 grid points of supply which include five power stations.

Two other instruments will help the control engineer to establish how the load is changing. The first is a meter showing the rate of change of total megawatt load and the second is a "target" meter showing the difference between the actual megawatt demand and estimated target demand given to the control engineer on a day-to-day basis; an alarm warns the control engineer when the total load nears the target.

This "target demand" is based upon a managerial decision which involves a detailed load assessment in relation to the following factors:—Preceding load conditions with seasonal variations; an appraisal of major load development at individual points of supply in relation to time factor; and estimated load building during the coming winter period.

These facilities are available to study loadings at any time, the rate of change of load as a percentage of the target and a printed record of what has been achieved every half-hour.

Provision is made to feed into the metering circuit a signal representing estimated lost load. This is intended to provide compensation for the loss of information due to line or equipment failure, unmetered load, grid metering out of order, etc., so that allowance may be made for this lost information and fed into the telemetering equipment where it will be added to the live information.

Off-Peak Problems

The authors give several examples of how manufacturers have been able to organise their production to reduce the load during peak periods either over a number of weeks or "on demand" from the control engineer. It has even been possible to take advantage of "valleys" in the load curve caused by meal breaks and mechanical failures. The offer of terms under "special agreement" has also been "quite effective." The cost to the consumer of such rearrangements can be "insignificant" and any reduction in maximum demand is a direct saving to both the consumer and the Board. In one area of the Coal Board, where there is a maximum load of 20 MW, a reduction in demand of 5-6 MW has been achieved.

Though the milestone of 1,000 MW of off-peak space heating load has been passed in South Wales, the authors point out that the transfer of industrial load or processes to off-peak periods is much more complicated. Unless the difference between on- and off-peak charges is substantial the extra cost of changes in working hours may more than compensate for savings in m.d. charges. Even where a factory is working two or three shifts and on-



The Pontypridd, South Wales, Central Control incorporates the latest telemetering equipment on the desk in the foreground

peak hours are confined to the four winter months, there will be a restriction on 1,020 hours or 35 per cent of the available hours during the period. This introduces serious problems of storage and excess capacity.

The authors believe that to avoid unnecessary requests for special metering for off-peak supplies it is advisable that these should be unpublished and offered only on special agreement terms. In aiming at a high differential between on-peak maximum demand charges and excess off-peak maximum demand charges, the effect on the Board's accounts must not be overlooked. It is reasonable, they suggest, to arrange for the excess maximum demand charges to cover the Board's capital associated charges and any general charges in connection with off-peak metering. A fair approximation can usually be obtained by taking the excess off-peak maximum demand charges as the difference between the normal on-peak maximum demand charge and the C.E.G.B. maximum demand charge. The remainder of the demand-related costs may then be collected in the maximum demand component of the unit charge.

It is thought reasonable to allow the seven or eight summer months to be included in the off-peak period for the purpose of the charges, and to achieve the minimum number of on-peak hours it is necessary: (a) to know the general shape of the system load curve; and (b) to know the load at any particular time on the system as a whole.

The system maximum demand will usually occur during certain hours in the morning or between 4 p.m. and 6 p.m. in the afternoon, and this latter period only constitutes a real hazard during the second half of December, January and the first half of February. Normal load growth will usually ensure that the demand in November and early December is exceeded in January unless it turns out to be a very mild month. The installation of telemetering equipment to summate the load at all grid points will enable the actual load on the system to be ascertained continuously; this should allow the on-peak periods to be reduced very much below the present accepted minimum, and may eventually allow the on-peak

periods in the case of selected consumers with major items of plant to be reduced to between 200 and 400 hours per annum.

Advantages to Consumers and Board

Central control by the Area Board has advantages for both the Board and the consumer. The cost of equipment involved is negligible in comparison with the major savings which can be made by both the consumer and the Board in m.d. charges. The cost of providing telemetering equipment is also "not unreasonable." The system is flexible and from the figures obtained from the telemetering equipment the annual charges to the Board and the savings on the maximum demand charges can be readily calculated and it is then quite possible to arrive at the minimum load reduction required to justify the installation of the equipment. Though initially confined to the larger consumers the authors see no reason why, with experience, it should not be extended to consumers with smaller loads.

Savings can also be achieved by the consumer by the use of maximum demand alarms. Equipment for the automatic control of maximum demand is more expensive, but it is usual for the capital cost to be recovered in a year or two and "even a longer period may appear to be a sound investment in most works." The authors do not think it is necessary to be unduly worried by the effect of better load control on diversity "because the time of minimum diversity will become the area system peak."

The facility under the new bulk supply tariff for dis-

connectable loads has, the authors feel, inherent disadvantages. It does not, for instance, differentiate between national and Area Board peak demands, and disconnection may not therefore assist the Board. Again the large loads to which it applies usually have a high load factor and the small reduction in cost per unit in the overall average will be marginal.

In looking to the future development of load control the authors visualise, within the Area Board's organisation, the use of television in conjunction with telemetering for finer control of private generating plant, the better utilisation of e.h.v. and h.v. systems and therefore a more effective use of capital investment. With the extension of load control to loads of 5 MW and above they also think that decentralisation of control will be needed and the complexity of the control operations may then require computer techniques. Again the financial advantages of load control may attract new loads, hitherto the monopoly of other fuels, which will have the desired effect of helping to improve the base electrical load.

As more Area Boards adopt centralised load control it will be necessary for the operation to be co-ordinated on a regional basis. The regions, in turn, would be controlled by a National Control Centre. The possible saving in demand, as reflected in capital expenditure in generation, transmission and distribution, would be equivalent to several large power stations. The authors consider that in a few years' time the load controlled by the South Wales Area Board will be 150 to 200 MW with an Area Board demand in the region of 1,500 MW.

FARADAY HOUSE DINNER

A SUGGESTION that the Institution of Electrical Engineers should incorporate the word "chartered" in its title was made by Col. B. H. Leeson, chairman of the Faraday House Engineering College board of governors, at this year's Faraday House Old Students' Association dinner held last Friday at Quaglino's, in London. Col. Leeson also spoke of the zonal system of education introduced recently by the College in which a comparatively narrow field was studied deeply for the award of Associate of Faraday House, saying that he thought this would become as widespread a practice with the expansion of scientific knowledge as was the sandwich course pioneered by the College.

Col. Leeson was replying to the toast to Faraday House proposed by Sir Harold Bishop, Director of Engineering of the B.B.C. Sir Harold said that although an adequate amount of money was being spent on science in this country there was still a shortage of engineers to find practical applications for scientific discoveries. As a private establishment Faraday House could develop as it wished to meet current needs and conditions. It had a great appeal to overseas students, which was good since it was as important to export trained men as it was goods, but there must be an adequate number of home-based students.

The toast to the guests was proposed by the chairman, Lt.-Col. R. W. C. Reeves, president of the Old Students' Association, to which the reply was made by Sir Hamish D. Maclaren, President of the Institution of Electrical

Engineers. Sir Hamish is also a governor of the College and at the time of the dinner was Director of Electrical Engineering at the Admiralty, a post he had held for over 15 years. This week, however, he has been succeeded by Mr. J. C. Thompson, an old Faradian and past-president of the Association. In his speech Sir Hamish commended a career in the Royal Navy or in Admiralty service, which he thought gave the professional electrical engineer the widest possible field.

Municipal Engineering

IN his presidential address last Tuesday to the Institution of Civil Engineers, Sir Herbert Manzoni discussed the work of municipal engineers. Sir Herbert, who is the city engineer of Birmingham, defined the municipal engineer as a civil engineer whose work covered an extensive field and included responsibilities of a sociological and administrative character. He then referred to the proposed amalgamation between the Institution of Civil Engineers and Institute of Municipal Engineers.

Sir Herbert thought that the worst of all modern symptoms were reluctance to take personal responsibility and a diminution, almost the absence, of individuality of thought and action. "We live," he said, "in a world of committees, and groups and teams, and like ants we are becoming conditioned to communal thought and mass activity."



General view of "T" block—the newly-built Atlas choke factory at Spennymoor

Fluorescent Control Gear Production

ATLAS SPENNYMOOR FACTORY EXTENDED

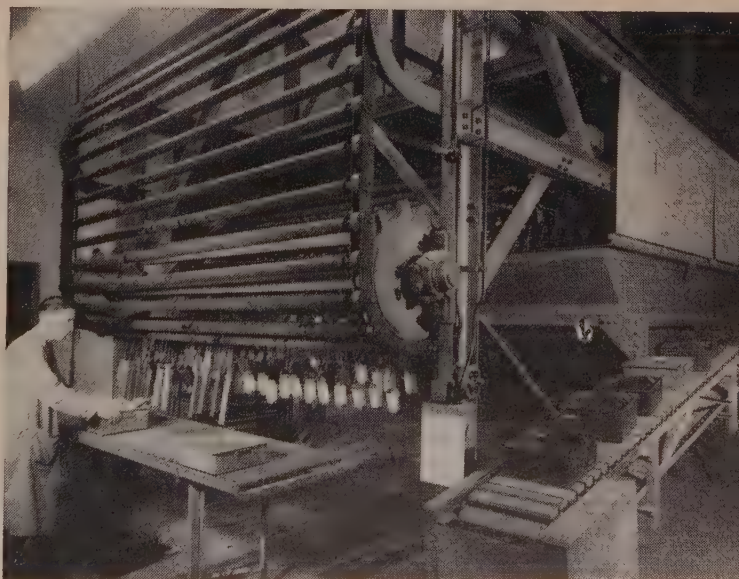
AN expansion and modernisation programme carried out by Thorn Electrical Industries, Ltd., at the Atlas factory at Spennymoor, Co. Durham, makes this one of the largest and most up-to-date production units of its kind in Europe. The company first went to Spennymoor in 1951 with a nucleus of trained personnel from the Enfield factory. At that time the staff numbered only 200. Now well over 3,500 people are employed in the manufacture of fluorescent lighting equipment, radio sets and electric cookers. The factories use more than 100 tons of copper and iron every week for fluorescent choke manufacture alone, and 10,000 miles of enamelled copper wire. Each year nearly 4,000 tons of sheet steel is used in the manufacture of fluorescent fittings.

Over the years Atlas have expanded their control gear activities in three ways—to meet the increasing demands for their own fittings; by supplying other manufacturers with components such as chokes, ballasts, accessories and starter switches; and by building up a vigorous export business for control gear. Approximately a third of the total output is now exported.

Production increases of 300-400 per cent in fluorescent fittings and control gear have been achieved in the last five years and, to meet present demands, a completely new building devoted entirely to fluorescent control gear manufacture has been constructed. The factory, known as "T" block, has been planned so that expansion in two directions is possible by adding extra bays and assembly lines as production demands require. It has been laid out on the most modern lines and careful

thought has been given to material handling and the progression and testing of components through every stage of production.

The basic requirements for the manufacture of a choke are coils wound on multi-winding machines, laminations of electrical sheet steel which are inserted inside the coil



The varnish impregnation plant in the Atlas choke factory. The capacity of the tank is 1,700 gal

and/or wrapped round the coil to provide a magnetic circuit, and a base and cover into which the coil and lamination assemblies are sealed.

At the beginning of the assembly line, pairs of inner lamination stacks with "Polyester" filling compound between them are inserted automatically into the coil. This coil and core assembly is placed into a jig, where inductance is set against a standard, and the units are then carried over a heating tower which hardens the "Polyester" cement and sets the gaps between the laminations. The outer laminations are then formed around the coil and the lead wires, which have previously been brought out from the coils, are insulated by means of sleeves. The coil and core assembly is then fitted into its cover and base and at this stage the inductance of the choke is set and tests are carried out. The equipment used for testing is made in the company's laboratories at Spennymoor and is essentially a cathode-ray oscilloscope



This electrostatic spray plant in the Atlas fittings factory enamels the metal chassis of the fittings automatically. The enamel is thrown centrifugally from a rotating disc and deposited electrostatically on to fittings as they are carried through on a conveyor

indicator operating on a bridge circuit where the unit under test is compared with a standard.

The units are then conveyed mechanically to the varnish impregnating plant, where there is a 1,700 gal varnish tank with a continuous filtration system. Regular tests are carried out on viscosity, solids content and temperature characteristics of the oven, with daily checks on depth of varnish impregnation and state of cure of the varnish.

After final assembly, including the addition of a terminal block, tests are made for insulation to earth (2,500 V r.m.s. between coil and case), open or short circuit, high and low inductance, watts loss, and starting current. Before each cycle of tests commences a signal

voltage passes through the test gear to ensure that it is not faulty. In addition, the gear is checked twice a day in case any fluctuation has taken place.

Apart from the manufacture of chokes for use in the Atlas "Super Slim" fittings, the company manufactures combined ballasts and many other types of chokes. In particular, a range of control gear has been developed using what is known as a "Permaset" filling compound. This compound, a Thorn development, is a resin and sand filling which has been adopted after careful engineering evaluation. The material is claimed to have a very high thermal conductivity, thus dispersing destructive heat from the coils. Being thermosetting, it will not melt and spill.

Fittings Factory Expansion

Last year a major extension was built on to the main fittings factory which allowed space for a new machine shop and steel stores. The final stage of this replanning scheme has now been finished and an entirely fresh layout has been completed for the assembly shop.

The "Super Slim" range may be taken as an illustration of how modern design and manufacturing methods speed up production. The Spennymoor factories manufactured one million of the old type of "Popular" fitting in four years, but expect to complete their first 'million of the new type in less than half that time.

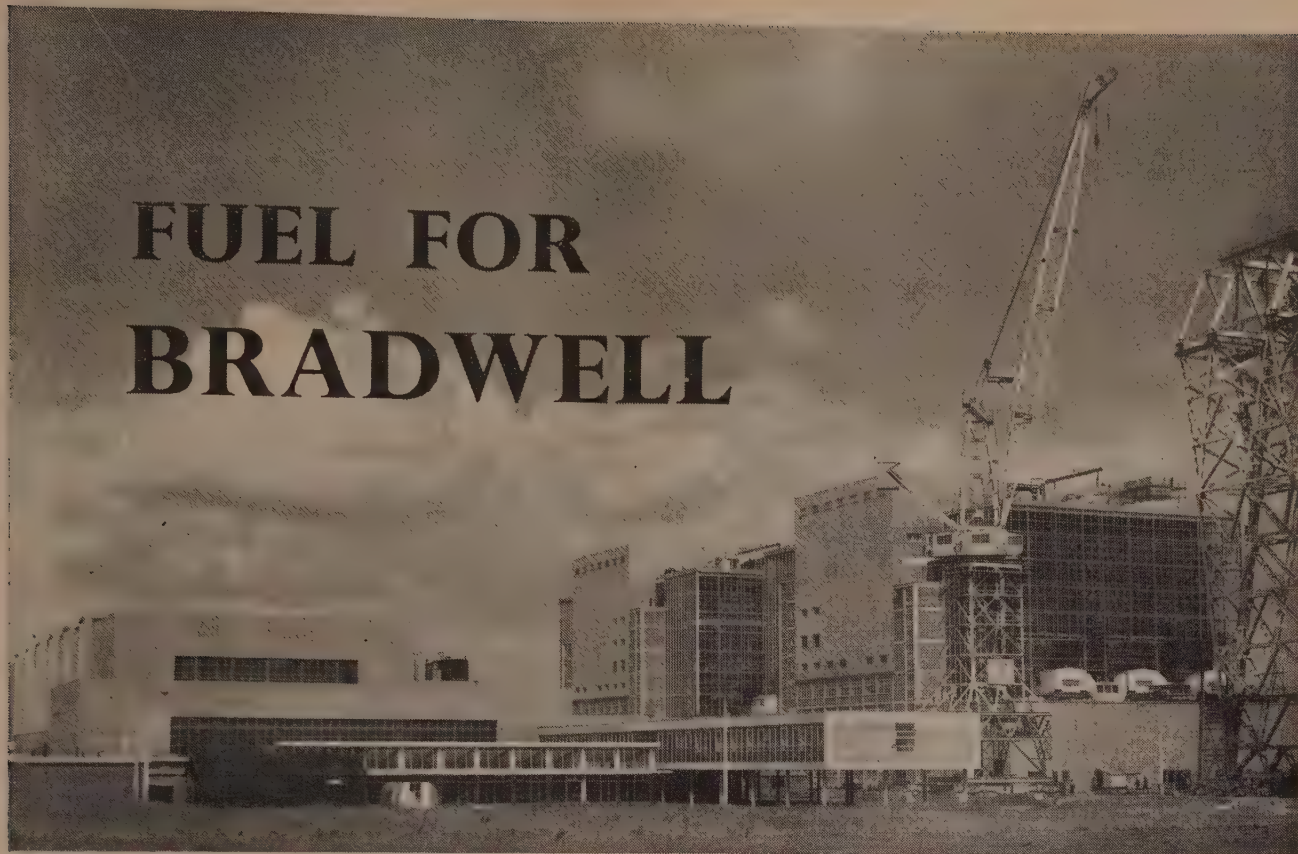
It was possible to adopt an integrated approach to the design of the finished product since Atlas manufacture their own fluorescent tubes, control gear, starter switches, accessories and fittings. This was an advantage in formulating the best design for a simple batten range of fittings which would be suitable for a wide range of uses. Several alternative approaches were possible; for example, the fitting could be made with a comparatively inexpensive brick type choke, but the fitting would tend to be needlessly bulky and the chassis would cost rather more. Alternatively, it was possible to design a slim fitting which would reduce the chassis cost but increase the choke cost.

The final decision was to adopt a $1\frac{5}{8}$ in square section for the choke, which resulted in a very slim fitting—roughly the same overall size as a standard fluorescent lamp. A further idea was the use of "pull off" lamp-holders which could be slipped into the chassis channel to save packing space. The new choke design necessitated new manufacturing methods, and a process has been evolved to produce rectangular laminations from sheet metal with the minimum of wastage. Special methods have been evolved for forming up the laminations and jigging and assembling the choke. Lampholders are made entirely automatically, and additional automatic moulding presses are installed for this purpose.

A further point is that the design of the new fitting has made it particularly suitable for tooling and special spot welding equipment has been developed for its manufacture. The shape has made it especially convenient for electrostatic spraying—an automatic process in which the only handling is for inspection.

Looking to the future, the company has authorised an additional new fittings factory to specialise in 8ft fittings and special fittings for lighting schemes. This factory will be so sited that it can be progressively expanded in future years.

FUEL FOR BRADWELL



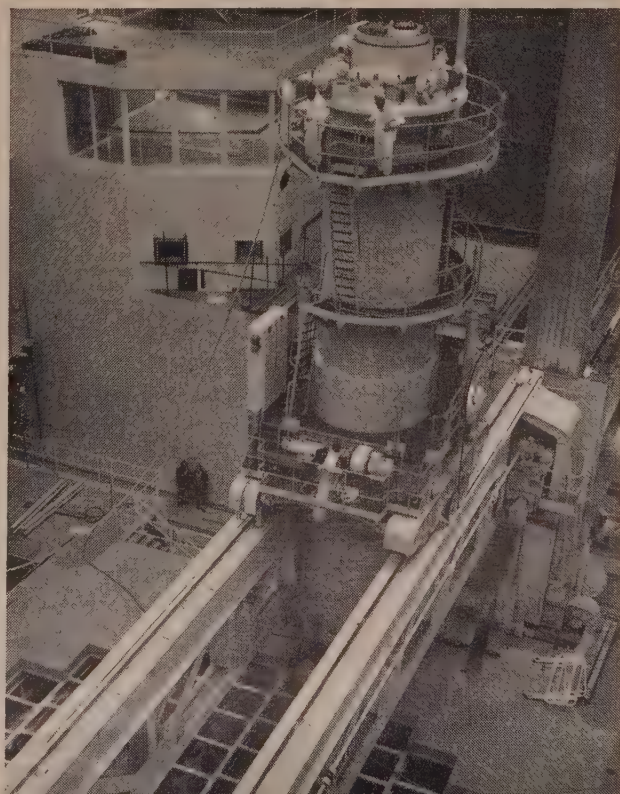
THE two charge/discharge machines for No. 1 reactor at Bradwell nuclear power station, Essex, have been fully tested and will shortly become operational. The first fuel elements are now arriving from the United Kingdom Atomic Energy Authority's works at Springfields, but loading of the first reactor will not begin until next March. This reactor should become critical by June, 1961, and it should reach full power three to four months later. Graphite loading of No. 2 reactor has just begun and it is hoped that the reactor will reach criticality by the end of next year. In the turbine hall, three turbo-generators are now complete, two are partially erected, while work is only just beginning on the sixth and last set. The standby diesel sets have all been installed. In No. 1 reactor building, the variable-frequency control rod motor-generator sets have been installed and the control room is virtually complete. Bradwell is being built for the Central Electricity Generating Board by the Nuclear Power Group.

Charge/Discharge Machine

The handling of fuel and all reactor components into and out of the Bradwell reactor vessels will be carried out by a single comprehensive machine, another identical machine being provided as a standby for each reactor. These machines, which weigh 400 tons and are 52ft high,

travel transversely on a gantry and longitudinally by means of the gantry. The gantry spans the reactor pile cap and runs on rails at pile cap level. Both gantry and machine have two speeds (20ft/min and 6in/min). Only one machine occupies the gantry at any one time.

After inspection, the fuel elements will be conveyed by hand trolley from a preparation room to the loading magazine in an adjacent room. The magazine incorporates a rotating turret, which can hold three channels



Above : The 275 MW Bradwell nuclear power station showing the turbine hall (left), No. 1 reactor (centre) and No. 2 reactor (right)

Right : One of the two charge/discharge machines for No. 1 reactor on the gantry above the pile cap

of fuel (24 elements), and a loading tube passing upwards from it to pile cap level. Turret rotation is controlled locally when fuel is being loaded into it. The charge/discharge machine can also accommodate three fuel channels and when the station is in operation it is expected that three channels will be recharged every 24 hours.

A charging standpipe will be prepared for use by removing the normal slab above it and fitting a special slab and telescopic make-up shielding piece in its place. A chute head box will then be lowered on to the top of the standpipe, making a pressure seal as it connects. The standpipe will then be ready to receive the charge machine which, having picked up new fuel from the magazine at the loading hole and being purged and pressurised with clean CO_2 , will travel to the standpipe and will be accurately aligned over it, using optical instruments at the base of the machine. The accuracy of the alignment is approximately $\frac{1}{16}$ in. A pressure seal will be made by raising the telescopic connector to mate with the machine

outlet and a radiation shield will be formed to interlock with the lower shielding of the machine. After charging and pressurising the space between the standpipe and machine valves, the machine will carry out, on load, all operations involved in unplugging the standpipe, changing fuel in three reactor channels and replugging the standpipe.

Control of machine gantry travel is by an operator at the base of the machine while other machine operations will normally be controlled remotely by an operator in a shielded control room situated in a corner of the pile cap area. Indication of all machines will be displayed on panels in the control room and television equipment will enable all parts passing between the machine and reactor to be viewed remotely. Once the machine has been connected to a standpipe it will take approximately 80 minutes to change one fuel channel. After being disconnected from the standpipe, the machine will travel to an unloading hole and discharge the irradiated elements through a chute to the cooling pond.

Letters to the Editor

Letters should bear the writers' names and addresses, not necessarily for publication. Responsibility cannot be accepted for the opinions expressed by correspondents.

Heat Pumps in Power Stations

THE letter from Mr. J. C. Edwards in your issue of 14th October criticises the C.E.G.B. report on certain grounds. I have been waiting to see if anyone would offer a more basic criticism, namely that it is quite inconceivable that bled steam heating can cost (properly costed) anything like the same as heating with a heat pump. Any comparison which purports to show bled steam at much the same price as pumped-up heat can only have been made on some false premise.

In the case of the C.E.G.B. report the false premise seems to be the charge for steam at £20 per therm plus 6.4d per therm consumed. Coal is quoted at £7.5 per ton. This is strictly, no doubt, a different and dearer coal suitable for use in a small boiler. However, the price per therm in live steam, allowing for 85 per cent boiler efficiency, should be about 8.8.5d on this basis. Therefore, 6.4d may be assumed to refer to the cheaper coal used by the main boilers. The price per therm in bled steam might be put at something like one-quarter of this, having regard to the availability of the heat at the bleed point being about one-quarter of that in live steam. The exact figure depends on the location of the bleed point which I take to be at about 180°F. Hence, we arrive at a running cost of, say, 1.6d per therm. In discussing the value of heat on an availability basis, it is to be remembered that the value per therm of the steam at the exhaust is negative (since it costs money to dispose of) and the bled steam is well on its way towards the exhaust.

The "£20 per therm" of m.d. appears to have been derived by taking the capital cost of power station boilers at something like £2 per lb of steam per hour = £200 per therm/hr, giving at 10 per cent charges an equivalent annual charge of £20 per therm/hr. Therefore, to make sense we should read £20 *per annum* per therm per hour.

This is all right for boiler steam but wrong for bled steam. The bled steam charge can be arrived at by considering that the full boiler output is still used to produce kilowatts and only the *loss* of kilowatts by bleed should be charged to bled steam. The sacrifice of output per lb of steam by bleed is a small fraction (possibly about one-quarter as used above) of the available heat in that pound. Hence only this fraction of the £20 should be charged. On a proper basis of costing, bled steam will come out in both components at something like one-quarter (or less) of the cost attributed to it, making the running cost distinctly lower than that of the heat pump.

This is basic thermodynamics which was, of course, all known before the heat pumps were put in and their installation in at least one of the cases was governed by considerations other than economy.

Esher.

B. Wood.

Channelling

IN his chairman's address to the Electronics and Communications Section of the Institution of Electrical Engineers, Mr. T. B. D. Terroni (Automatic Telephone & Electric Co., Ltd.) described the work of a telecommunication engineer concerned with carrier transmission. The field was a large one, he said, but there was one piece of equipment which could be said to be common to most eventual uses to which telecommunication would be put. Channelling was required for a multitude of purposes including those allocated to speech, music or high-speed signalling. It was intended to convey the translation of a speech band to its appropriate position in the frequency spectrum so that an assembly in such channels could be handled as a unit block for grouping into larger blocks for subsequent transmission.

VIEWS on the NEWS

By "REFLECTOR"

THE Area Electricity Boards' statutory right of entry into private premises to disconnect the supply is a constant source of misunderstanding. It has been raised again in recent correspondence to *The Guardian*. The objection that an Englishman's home is his castle is well known, but I think that a complaint is on stronger ground when it is based on the way the Boards sometimes exercise this right.

I have no sympathy with people who are slack in paying their bills and increase costs by making it necessary for the Boards to send out reminders. Yet it is not difficult to imagine unfortunate circumstances in which both a bill and the reminder may be genuinely overlooked or where for one reason or another the bill could temporarily not be met. The supply should not be cut off without sympathetic investigation, and those who are sent to carry out the work should leave the supply connected if, at the last moment, the consumer proves able or willing to pay.

Another right which Boards possess is to demand a deposit from new consumers as a surety that future bills will be paid. A letter from Lincoln, in the same correspondence, tells of a consumer who was asked by the East Midlands Board to send £8 "by return of post," but, says the writer, "I was quickly assured over the telephone that it was not really necessary for me to pay such a sum." Why then, one wonders, was it demanded? The publicity given to such actions effectively counters efforts which the Boards make to improve their public relations.

* * *

Recently a columnist on the *Sheffield Telegraph* took the Yorkshire Electricity Board to task for allegedly delaying the return of electric blankets sent to them for adjustment on the occasion of a voltage change. This brought a letter from an elderly couple who complained that they had not yet had back a radiator which was collected for repair three months earlier. They had written to the Board about it and had no reply, which is perhaps not surprising because it was an oil radiator—probably collected by the supplier or maker after the scare about the dangers of oil heaters.

* * *

Proposals are being made by some Electricity Boards that electricity meters should be read half-yearly and that bills for intermediate quarters should be based on estimated consumption with subsequent adjustment. Objec-

tions to this idea are naturally being aired, but I think that most of them are irrational. If a corresponding quarter is used as a basis for the estimate it is unlikely that there will be a very great discrepancy, although there may be some cases governed by special circumstances. The scheme should be judged by the economies it produces. If these are substantial it means an ultimate saving to the consumer which may (I say *may*) result in lower charges. At least they may help to stave off increases.

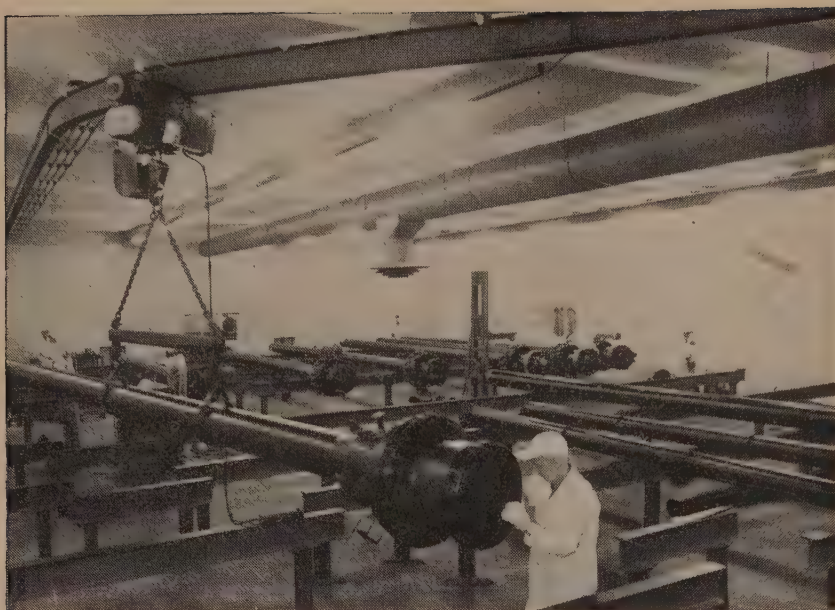
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I have seen a copy of a memorandum submitted as evidence to the Special Advisory Group on the British Transport Commission (of which Sir Ivan Stedeford is chairman) by the Railway Conversion League. Most readers of the *Electrical Review*, I suppose, support the idea of the conversion of the railways either to diesel-electric traction or to full electrification. This League, however, aims at a different kind of conversion—the use of the railway tracks as roads. If there were any possibility of this coming about it would be foolish to persist with electrification, but I fancy that the B.T.C. can safely go ahead although the economics of its plan are questioned by the League. The memorandum costs 5s and is obtainable from the League at Hallams Heath, Sharncliffe Green, Guildford.

* * *

This week's glimpse of the past comes from the *Electrical Review* of 1st November, 1880:—

"A very successful application of the electric light has been exemplified in the lighting of the Orient s.s. *Chimborazo*, which left Gravesend on the 24th for Australia. The installation consists of a Gramme machine generating the current by which seven incandescent lamps using 2 mm carbons are worked. Four of these are fixed in the main saloon, and the remainder in the steerage, where this mode of lighting is a great desideratum. The lamps are placed in series, but a resistance coil and automatic switch renders each independent from its neighbour. Several spare lamps are carried which can be worked from the same machine. The whole current can also be switched on to a Crompton arc lamp, which is contained in a special lantern fitted with a reflector. This will be used when in port for loading and discharging cargo. . . . The extension of the lighting to the other parts of the ship will be completed on her return."



**'CLEAN CONDITIONS' SHOP
AT THE STEWARTS & LLOYDS
TOLLCROSS WORKS, GLASGOW**

Pipework for Nuclear Reactors

MANY complicated components for nuclear reactors are made from steel tubes and the Pipework Engineering Division of Stewarts & Lloyds, Ltd., is producing a variety of such components at the Tollcross Works in Glasgow. A typical example of this work is provided by the 424 nuclear reactor control rod standpipes designed by the General Electric Co., Ltd., and ordered by the Motherwell Bridge & Engineering Co., Ltd. These are being manufactured for the Hunterston nuclear power station which is being constructed by the G.E.C. and Simon-Carves Atomic Energy Group for the South of Scotland Electricity Board.

These standpipes are the means by which the reactor power level is governed. Through them are introduced rods containing boron which absorb neutrons to control the rate of reaction. They also carry the "burst cartridge detection" tubes which extract gas samples to detect ruptured uranium fuel element cans. Each of these 32ft long standpipes consists of 63 tubes assembled to a very high degree of straightness, various cavities being filled with high-density barytes concrete to act as biological shielding.

Effects of Contamination

A requirement of all reactor components is that they must be scrupulously clean because certain elements present in dirt or dust particles could damp down the reaction and also make the gas stream radioactive. The original concept of clean conditioning was that, in general, it would be carried out within the reactor during erection. Increased complexity in the design of components has, however, resulted in that being impracticable in many cases. Consequently it has become more general for components to be clean conditioned at the works before dispatch to site.

The form of clean conditioning which Stewarts &

Lloyds employ at the Tollcross Works consists of degreasing, shotblasting and vacuum cleaning the component parts, followed by the application under dust-free conditions of a protective coating to prevent rusting. Clean conditioning of the parts is followed by assembly under dust-free conditions and sealing of the assembled components before removal from the clean shop.

Anti-dust Precautions

The clean shop at Tollcross is a building within that part of the main building used for nuclear engineering work. The clean shop itself has a floor area of 7,000 sq ft and is divided into two main compartments, one for vacuum cleaning and dipping the parts in protective coating and the other for final assembly. It is of dust-proof construction with double-glazed windows and rubber-edged doors. The floors have a special surfacing and the rest of the interior is finished with paint which is free from constituents which might contaminate the products. Electrically heated and very highly filtered air is supplied under pressure. Employees enter through a changing room and wear special overalls, caps, gloves and rubber boots.

The plant layout and mechanical handling aids have been arranged so that delays between successive cleaning operations are minimised. This is necessary to avoid incipient rusting and contamination between the first cleaning operation on a part and the application of its protective coating. Adjacent to the clean shop entry doors are the two degreasing units and the shotblast unit. From these plants electric monorail hoists run into the clean shop, over the dipping bath and throughout the final assembly compartment. Between hoisting stations, parts are rolled along rubber-lined skids. The clean shop and its associated plant have been fully approved by the United Kingdom Atomic Energy Authority.

INDUSTRY AND THE HOUSE

Policy on Railway Modernisation Debated

By AUSTEN ALBU, M.P., B.Sc., A.M.I.Mech.E., M.I.P.E.

IN the last three days of the old session the House of Commons managed to devote a day to debating British Railways. There was general agreement that this was one of the best ever debates on the railways because of the enormous amount of material provided by the report of the Select Committee on Nationalised Industries. On the other hand there was severe criticism from the Opposition benches because the Minister of Transport was still unable to give the House the benefit of the findings of the Special Advisory Group under the chairmanship of Sir Ivan Stedeford of the Government's own decisions on the future organisation or of the B.T.C. The House was at first stunned to hear that he had, in fact, set up yet another committee to examine the railways with himself as chairman.

On second thoughts, however, members were inclined to welcome this committee whose task is to consider what sort of and how big a railway system we need in view of the developments in both road and air transport. In fact, Opposition members, led by Mr. Wedgwood Benn, made a strong attack on the Ministry of Transport for having failed in the past to undertake any serious study of future transport requirements with which a plan for the future of the railways must fit. Mr. Benn made great play with an exchange of question and answer on this subject in the Select Committee between your contributor and the Permanent Secretary of the Ministry. It was felt by members that the setting up of the new committee might represent a belated recognition of his responsibilities in this respect by the Minister whose attitude towards the B.T.C. and its chairman has been the subject of severe criticism by members on both sides of the House.

Cut in Capital Expenditure

This criticism was hardly answered by Mr. Marples's speech, a large part of which was devoted to emphasising the railways' losses and to asking questions to which he is at present unable even to suggest answers. He gave the House, however, one piece of factual information: the Commission's investment plans are to be cut for 1961 from £200 million to £175 million. Maximum expenditure on the railways is to come down from £160 million to £140 million. While yet a further reassessment of the London-Midland electrification scheme is made, no new contracts will be placed.

Sir Richard Nugent, an ex-Parliamentary Secretary to the Ministry of Transport, said that the success of the modernisation plan depended on the right equipment, on the rationalisation of the existing system and, thirdly, on manpower economy. He said that considerable increases of revenue are coming in as a result of the new equipment and so the Commission should be credited with a high measure of success, despite the criticism now going on about the cost of the Midland electrification scheme. He

believed that the modernisation plan had foundered on the rocks of rationalisation and manpower economy.

Mr. Ray Gunter, fresh from his success at the Labour Party conference, said that there was an air of complete unreality about the debate. He was referring, of course, to the absence of the report from the Stedeford Advisory Group. He warned the Minister that the trade unions would not stand for any attempt to put the wage structure on a regional basis.

Select Committee's Views

Sir Toby Low, chairman of the Select Committee, was at pains to answer Mr. Benn's gibes that the findings of the Committee had completely refuted arguments which the Prime Minister had put to the House at the time of the appointment of the Advisory Group. Nevertheless he reaffirmed the Committee's view that a large-scale British railway system could be profitable and that British Railways were and must remain an integrated system. He entirely disagreed with those who wanted a series of regional boards responsible to a Minister. He emphasised the degree to which decentralisation had already gone and was now moving.

Sir Toby explained the views of the Committee on the Government's relations with a nationalised industry especially where it acted as a banker. The Government should be able to work out the return anticipated on a large investment. There had been difficulties inside the B.T.C. and between it and the Select Committee and the Government about how to test what the yield on the London-Midland electrification scheme would be. He suggested a nationalised industry investment advisory council, consisting of men experienced in finance, in industry, and, perhaps, in science, with the co-operation of the T.U.C.

On the London-Midland scheme it was Sir Toby's strong opinion that the scheme having gone so far as it had, the sooner it was finished the better. He finished his speech by saying that the crisis in the railways was not just one of money and trade and machines. It was now one of morale and confidence and men. The return to confidence must begin in the House and could only begin when there was a clear-cut plan for the future of the railways on an efficient and generally profitable basis.

Mr. Percy Collick, an ex-locomotive driver himself, welcomed the realisation by the Select Committee that the Government should be responsible for financial deficits caused by the Commission being compelled to keep in being unprofitable services. Mr. Charles Longbottom, the Conservative member who sits for York, said that modernisation was not a programme for new investment. Much of it should have been done 20 or 30 years ago. We should look at the programme as a whole and not try to prejudge what was only a half-done job.

Only one wholly critical speech was made, by Mr. James Dance, a Conservative member, although your contributor had some severe criticisms to make of the B.T.C.'s attitude to its engineering staff. Mr. Dance wanted to go back to the old separate main line systems. The speech of Mr. Holt, a Liberal member, was distinguished by a categorical statement that it was the policy of his party that the system of A, B and C road transport licences should be abolished and that there should be free competition between road and rail. It seems that some Liberals, in spite of their recent conference, still dream of returning to the days of Adam Smith.

Mr. Mellish had to wind up for the Opposition with nearly all his supporters upstairs debating the future of their party, which was a pity because he is an attractive, fighting speaker. He blamed the cumbersome procedure of the Transport Tribunal for some of the B.T.C.'s losses. He said that the time had come when the railways should be allowed to compete fairly and honestly and to quote what prices they thought were economic. He said that any cutting down of the modernisation plans would be disastrous for the Commission and put it further into the "red." He pointed out that there was a great deal in common between the conclusions of the Select Com-

mittee and those of an inquiry carried out by the T.U.C., particularly in regard to Government contributions to the upkeep of uneconomic lines retained for social reasons. The T.U.C. report suggested that the Government should assume responsibility for the whole of the B.T.C.'s capital burden and should charge it a reasonable rent based on ability to pay, the rent to be subject to periodic revision in the light of changing circumstances. He finally urged that the whole question of the B.T.C. should be taken out of political argument. It was entitled to expect from the Government not only assurances about today, but tomorrow as well, so that it might work on a forward-looking programme.

There are rumours that the Special Advisory Group's findings are not as hostile to the B.T.C.'s organisation as they were at first expected to be. It seems as if they, like members of the Select Committee and, who knows, the Minister himself, are finding that their simpler prejudices do not always stand up to the very complicated facts. On one matter all are agreed: the sooner the Government announces its own decisions on the future of the railways the better for them and their long-suffering staffs, and the better, incidentally, for the British electrical manufacturing industry.

Parliamentary Report

THE Minister of Transport (Mr. Marples), announcing that the "ceiling" on railway modernisation expenditure in 1961, at £140 million, would be £20 million less than the sum originally agreed for the current year, gave the London Midland electrification scheme as an example of the increased costs that had been worrying the Government. The Special Advisory Group, he said, had expressed doubts about the economic aspects of the scheme and the British Transport Commission had prepared a reassessment. This was under urgent examination by the Ministry and pending the outcome the Commission had agreed not to place any new contracts. There was no question of cancelling existing contracts.

The Minister's Parliamentary Secretary, Mr. Hay, added that it was now known that the scheme would cost about £160 million—two and a half times the expenditure on major and new construction of roads in 1960-61 or eight times the cost of the Mr. Whether it would be worth while in the long run to continue with the scheme or better to use some of the money on other forms of transport was the kind of question that would be considered by the study group set up during the summer under the chairmanship of the Minister.

The chairman of the Select Committee on Nationalised Industries (Sir Toby Low) said that although in future

far more details should be asked before approving a £160 million electrification plan the sooner the London Midland scheme was finished the better, since it had gone so far.

Mr. Albu, a Labour member of the Select Committee, said the Commission's decision to introduce the 25 kV a.c. system and to order a large number of electric locomotives straight from the drawing board was courageous. Of the 40 countries whose representatives attended the recent British Electrification Conference six, he understood, had already adopted the British standard and more were likely to do so.

British Railways employed an incredibly low proportion of qualified scientists and engineers—0.3 per cent of the staff—and in 1959 employed only 277 qualified electrical engineers. It was frightening that witnesses before the Select Committee showed no awareness of the level of professional staff needed for the technical changes taking place. The Commission provided a quite inadequate number of scholarships to universities and colleges of advanced technology compared with the Central Electricity Generating Board and most private industries.

Tropospheric Forward Scatter

Lord Carrington, First Lord of the Admiralty, denied a suggestion that Tropospheric Forward Scatter Wire-

less Stations such as the United States Air Force intended to build at Ringstead Bay, Dorset, would be out of date in less than two years because of successful tests by the Americans in "bouncing" radio waves off satellites in outer space. He was advised that the U.S.A.F. saw no early prospects of being able to rely entirely on orbiting satellites for secure and economic communications. They expected to need the proposed station at Ringstead Bay for a long time to come.

G.E.C. Semiconductor Division Expands

One of Lancashire's largest mills, at Reddish, has been acquired by the G.E.C. Semiconductor Division to enable them to proceed with their expansion plans. All capacity at their present factory at Hazel Grove (1,500 employees) will be fully occupied by the end of 1960, and fresh production space is essential to cope with a rapidly increasing demand.

The new factory will be known as Broadstone Works, and has a working space of 600,000 sq ft. Manufacture of semiconductors is expected to start in the early part of next year. In the meantime, the sales and administration offices will be moved into Broadstone, making extra space available at the Hazel Grove works, where full-scale operation will continue.

NEW ELECTRICAL EQUIPMENT

Pulse Generator

The Du Mont pulse generator Type 404 recently introduced by AVELEY ELECTRIC, LTD., Ayron Road, Aveley Industrial Estate, South Ockendon, Essex, can provide continuously



Aveley Electric pulse generator

variable repetition rates from 100,000 p.p.s. down to a single manually-triggered pulse. Two features are the maximum rise and fall times of 0.02 and 0.025 microsecond (max.) respectively, and the continuously variable pulse width from 0.05 to 100 microseconds. There are also facilities for pulse delay before or after trigger; an output trigger to synchronise external equipment; push-button multi-step attenuation calibrated in 0.5 dB steps to 59.5 dB and 50 V output to a load impedance of 50 Ω , with a maximum rise time of 20 milli-microseconds at full amplitude. The instrument operates on normal supply voltages and has a power consumption of 600 W.

Plant Control System

Complete installations for the digital indication and printing of measurements of plant consumption are now being offered by RADIATRON, 7, Sheen Park, Richmond, Surrey. They are intended for automatic plant supervision and cost control where more complicated electronic computer systems are not justified. The equipment operates from instruments producing an electrical pulse or switch closure for each unit consumed. It is based on the "Kienzle" transistorised digital printer and uses counting stores which retain their information in the event of mains failure. Pulses from the measuring instruments are integrated in the stores and displayed continuously on electro-mechanical registers or in-line indicators. A programming unit initiates printing at pre-set times in some or all the channels and includes switches for

each channel to select either totalising or resetting to zero after printing.

Two types of printer are available, the type D10E which prints the channel number and count in a vertical column at a speed of 3 lines/sec, and a carriage type printer, D10SW, with carriage widths up to 620 mm, i.e. 150 characters. The printing speed is approximately 2 channels/sec.

Night Storage Heaters

A range of night storage heaters in 1, 2 and 3 kW sizes is now being manufactured by GREEN BROS. (ELECTRICAL), LTD., 19, Market Place, Brackley, Northants. Designed for use in offices, schools, churches, etc., these "Chanrad" heaters are controlled by a time switch which can be set to switch the heaters on and off within off-peak tariff periods. The recommended charging period is 10 hours with a two-hour boost during discharge.

The heaters are constructed of sheet metal with a fire-brick mass interior, insulated with glass fibre. They measure 32½ in high by 11½ in deep and the respective widths are 13½, 24 and 34½ in. The prices are £11 (1 kW), £15 10s (2 kW) and £19 (3 kW). The finish is in hammered silver grey and chromium plated guards are available as an extra.

Electric Cot Blanket

An electric blanket, measuring 36 in by 20 in, suitable for use in a cot, has been produced by PAKAMAC SPECIAL PRODUCTS, LTD., Moorside Mill, Oldham, Lancs., under the trade name



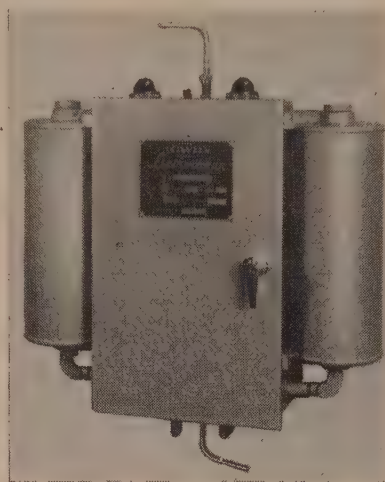
Pakamac Special Products "PakaTherm" electric cot blanket

of "PakaTherm." It is available in nursery prints, as well as pink, blue, green and white p.v.c. The appliance is claimed to be flameproof and completely waterproof. Models are avail-

able for use on the 220/240 voltage ranges and the price, including purchase tax, is £2 11s 6d.

Air Dryer

The Type B-6-A dryer developed by the Lectrodryer Division of the McGraw-Edison Co. of America and



G.W.B. Furnaces air dryer

now being manufactured by G.W.B. FURNACES, LTD., P.O. Box No. 4, Dibdale Works, Dudley, Worcs., is intended for applications requiring very dry air or other gases in quantities up to 20 cu ft/min. Typical uses include supplying dry air to instrument controls, waveguides and small cubicles. The dryer, which weighs 70 lb, is suitable for operation from a 230 V 50 c/s supply and the design ensures that the air flow is not interrupted if this supply should fail. The automatic operation of the dryer is independent of air operating pressure variations between 5 and 150 p.s.i.

Mild Steel Electrodes

Two additions to their range of arc-welding electrodes have recently been announced by the LINCOLN ELECTRIC CO., LTD., Welwyn Garden City, Herts. The first, "NuFive," is a smooth flowing mild steel electrode of the cellulose type designed for welding mild steel in all positions with a.c. or d.c. It is suitable for pipe welding, using either the conventional or "stovepipe" techniques. The electrode, which conforms to the requirements of B.S. 639:1952, is approved by Lloyd's Register of Shipping and the Ministry of Transport for the welding of mild steel in all positions. The British Classification is E.111 (B.S.

1719), the American Classification being E.6011 (A.W.S./A.S.T.M.).

The other addition is "NuSeven," an electrode of the iron powder-rutile type for general application to the welding of mild steel in all positions. A higher deposition efficiency compared with conventional titania type electrodes with a faster deposition rate and less sticking of the electrode, are amongst the advantages claimed for "NuSeven," enabling up to 30 per cent more weld per electrode to be obtained. The "NuSeven" electrode is also approved by Lloyd's Register of Shipping and the Ministry of Transport for the welding of mild steel in all positions. Its classification under British Standard 1719 is E.917, the American Classification being E.16014 (A.W.S./A.S.T.M.).

Combined Lighting Fitting/Shaver Socket

The model SD.5/SS clip-on bed or mirror lighting fitting manufactured by LINOLITE, LTD., 118, Baker Street, London, W.1, is now being offered with a 2-pin 5 A shaver socket at one end. The unit is supplied ready wired with 9ft of flexible and its clip-plate enables it to be clipped either on to a bed head or mirror. It is fitted with a switch and is available in



Linolite clip-on bed/mirror shaver light

ivory, dove grey or pink with a white diffusing shade. The price, complete with a 60 W 284 mm tubular lamp and including purchase tax, is £3 12s 3d. It is packed in an attractive presentation carton which can also be used as a display unit.

Stabilised Voltage Source

A self-contained unit which will give an output of approximately 1 V d.c. with a stability comparable with that of a standard cell has been announced by COMMUNICATIONS (AIR), LTD., Half Moon Street, Bagshot, Surrey. It is suitable for energising the potentiometer circuit of millivolt recorders and similar applications where the stability required is associated with an ability

to draw a larger current than is obtainable from a standard cell. Three models are available, for line supplies of 107 to 127 V or 210 to 255 V single-phase 48-52 c/s or 24 to 31 V d.c., all suitable for operation in ambient temperatures of -20 to $+55^{\circ}\text{C}$.

The impedance between the negative output terminal and case is $60\text{ M}\Omega$ in parallel with 150 pF and there is a maximum stray magnetic field of



Communications (Air), Ltd., stabilised voltage source

0.075 gauss r.m.s. at 6in from the unit. The output current is $10\text{ mA} \pm 0.25\text{ mA}$ and the output load is $105 \pm 4\ \Omega$. A potentiometer gives output load adjustment to ± 10 per cent and the output ripple is not greater than 0.1 mV . The output has a temperature coefficient of ± 0.001 per cent/ $^{\circ}\text{C}$ and there is a 0.001 per cent change in output for 10 per cent change in input.

The unit is housed in a hermetically sealed mild steel case $2\frac{3}{4}$ in by $2\frac{3}{4}$ in by $3\frac{3}{4}$ in high plus terminations, which for the input and output are polythene insulated $\frac{5}{16}$ in high solder posts. The prices are £16 5s each for the a.c. supply models and £14 14s for the d.c. input version.

Redesigned Morphy-Richards Cleaner

An improved "Super Suction" vacuum cleaner is announced by MORPHY-RICHARDS, LTD., 50, Conduit Street, London, W.1. Known as model VCA, it has fitted castors, a swivelled hose entry cap and the accessories have been redesigned. The carpet nozzle is of particular interest. It has been developed for dealing with the special texture of modern rubber-backed carpeting and is also efficient in cleaning other types. The under-surface of the nozzle has a series of graduated ridges which allows a constant intake of air over a wide area of carpet. This air flow, combined with the suction power from the cleaner's 1 h.p. motor, simultaneously

lifts dust and grime as well as hair and threads.

A clip-on attachment transforms the carpet nozzle into a general purpose brush for cleaning wood, lino or tiled floors. Other attachments include a soft dusting brush, a crevice nozzle, and an upholstery nozzle. The hose is constructed from a reinforced steel p.v.c. material which is flexible and light in weight for ease in handling.



Morphy-Richards model VCA "Super Suction" cleaner

The hose entry cap swivels to allow the hose to be swung into the most manageable position without moving the appliance. The total reach with hose and extension rods is 11ft. For extra mobility, the cleaner is permanently mounted on a trolley fitted with three p.v.c. castors.

The total weight is 17 lb and a sturdy handle is provided for lifting purposes. The cleaner has a loading of 750 W and is available in voltage ranges from 110 to 260 V, a.c. only. The price is £21 7s plus £3 17s purchase tax.

Cleaning Solvent

An improved inhibited grade of the methyl chloroform cleaning solvent manufactured by the Dow Chemical Co. of Michigan is being marketed in this country by PENETONE-PARIPAN, Egham, Surrey. It has no flash or fire point, eliminating the need for explosion-proof motors and wiring and it may be used on electrical apparatus including rotary machines and printed circuits without leaving a film liable to cause tracking.

Insulation Tester

The "Yew" portable insulation tester, model L.5, is now available in the United Kingdom from the ELECTRICAL INSTRUMENT CO. (HILLINGTON), LTD., Boswell Square, Glasgow, S.W.2, in two ranges, 500 V/1,000 M Ω and 1,000 V/2,000 M Ω . These instru-

ments contain a hand-driven constant voltage generator and a moving coil ratiometer indicator. A separate guard terminal is provided for measuring volume resistance to eliminate the influence of surface leakage.

Each instrument is shock—up to 100 g—and vibration tested, and supplied with a test certificate. The influence of changes in external temperature or humidity are negligible



"Yew" portable insulation tester

and the shielded movement makes indications practically independent of external magnetic fields. The instru-

ment is finished in a grey aluminium case and weighs 5 lb, the dimensions being 4.2 by 4.6 by 6.6in.

Electro-Chemical Time Indicators

A series of electro-chemical, elapsed time indicators have been introduced by INDUSTRIAL INSTRUMENTS, LTD., of 9, Paved Court, Richmond, Surrey, for the recording of the total operation



Industrial Instruments time indicator

time of electrical equipment. These indicators, known as the "Selachron" range, have been designed in forms

suitable for either a.c. or d.c. operation and in sizes for use with voltages of from 6 to 300 V, thus obviating the need for any extra switches or relays and allowing them to be wired to the terminals of the equipment being timed.

These indicators have no moving parts and consist of cartridges which contain small, replaceable electro-chemical cells, embodying an anode, cathode and electrolyte. The anode is consumed as current passes through the cell, the length diminishing in proportion to the accumulated hours of operation, this being shown by a calibrated scale alongside the anode. The length of each indicator is $2\frac{3}{8}$ in, the diameter being $\frac{1}{4}$ in. The weight is less than 2 oz.

Electric Wrist Watch

In the 14th October issue of the *Electrical Review* a description was given of an electric wrist watch introduced by Avia of Switzerland and distributed in this country by LOUIS NEWMARK, LTD., Prefect Works, Purley Way, Croydon, Surrey. In this description the prices quoted were incorrect. The watch is at present available only in an all-steel case at £43 15s and gold plated at £45.

INDUCTION HARDENING MACHINE

A MACHINE has recently been supplied by Induction Heating Equipment, Ltd., 11, Molesey Road, Hersham, Walton-on-Thames, Surrey, to Tractor Shafts, Ltd., of St. Albans, for induction hardening shafts for tractors. Designed for operation on an automatic cycle, it has a capacity for shafts up to 3in diameter by 24in long which may have flanges of 5in maximum diameter. Electricity is supplied by a 50 kW 10 kc/s vertical water-cooled motor alternator, which has provision for automatic voltage stabilisation, and is housed with the associated control equipment in a floor-mounted unit. The high-frequency transformer and the condensers for power factor correction are housed in another unit, which carries the non-moving single-turn inductor coil. Cooling water from the transformer is passed through this coil.

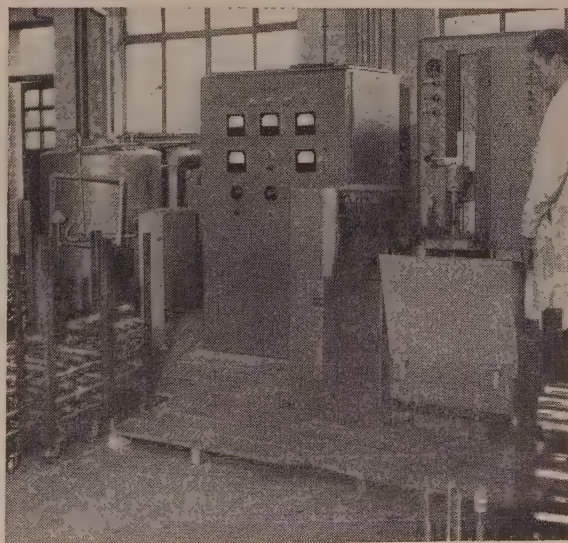
During the working cycle, the shaft to be hardened is held between centres, and is rotated and passed vertically through the coil. For hardening shafts with a centrally-positioned flange, the work is loaded between the centres, and is traversed

upwards to bring the flange close to the inductor coil. The work drive is then started and the power supply switched on, and when the shaft has been brought to the required temperature, the water supply for quenching is turned on, and the traverse movement downwards is started. In this manner, one side of the flange and one end of the shaft are hardened. The shaft is then inverted in the centres, and the sequence of operations is repeated.

The voltage supplied by the alternator, the traversing speed of the work, and the power and water supplies are automatically controlled during the working cycle, to give the required hardness pattern on the shaft, by micro-switches operated by holes in a 20 by 6in Paxolin card.

This card is housed in the unit which incorporates the slide for the work-head and tailstock. Interchangeable cards can be provided to suit particular hardening operations which are to be carried out.

Tractor shafts are treated on this automatic induction hardening machine manufactured by Induction Heating Equipment, Ltd.



INDUSTRIAL NEWS

MORE EXPORT CREDIT FACILITIES

FURTHER assistance for exporters through the Export Credits Guarantee Department was announced last week by the President of the Board of Trade, Mr. Maudling. This follows a previous announcement that longer credits would be given in special cases.

As part of the Dollar Drive, Mr. Maudling stated, the Export Credit Guarantee Department were authorised to give special assistance to exports to the dollar markets. The Government has now decided that E.C.G.D. should also give special attention to the possibility of assistance by means of its guarantees (in appropriate cases) in the development of exports to Europe and other markets.

"Accordingly, if promising opportunities for expanded sales can be

shown to be in prospect, the Department has been authorised to consider extending cover on a scale sufficient to develop these opportunities, as well as to facilitate increased production in some cases where this may be called for. The promotional venture guarantees will not, however, be available generally as experience has shown that these guarantees give rise to an excessive amount of investigation which is not commensurate with the results achieved."

During the third quarter of 1960, a record level of new business—£180.2 million—was declared under E.C.G.D. "commercial" insurance. Business in the first nine months of the current year showed an increase of 13 per cent compared with the corresponding period of 1959.

Opening of English Electric House

LORD NELSON of Stafford, chairman of the English Electric Group, and Lady Nelson were hosts in London last week at a private reception for some three hundred guests. The occasion was the official opening by Lady Nelson of the new headquarters offices of the English Electric Group in the Strand, London.

As part of the morning's programme, a special exhibition was arranged showing products of the group both past and present. Among the most interesting of these was the original

Marconi transmitter built for the 2LO studio which was once on the seventh floor of the Marconi wing of the new building. A recently completed collection of portraits of the founder engineers of the original companies which now form the group was also shown. Painted by Mr. Sidney Tushingham, these include David Napier, John Kerr of Preston, Peter Willans and Mark H. Robinson of Rugby, the Siemens brothers of Stafford, Guglielmo Marconi, and George Stephenson, builder of the "Rocket."



Lady Nelson looking at the commemorative plaque which she unveiled at English Electric House. On her left are Mr. P. Horsfall, a director of the English Electric Group, and Lord Nelson, chairman

Air-Ground Telemetry Consortium Formed

A CONSORTIUM of five British electronics manufacturing companies has been formed on the recommendation of the Ministry of Aviation to exploit the overseas and U.K. markets for a major air-to-ground multi-channel telemetry system.

The system has been developed by the member companies in collaboration with the Royal Aircraft Establishment, Farnborough. The manufacturers participating in the consortium are: Elliott Brothers (London), Ltd. (a member of the Elliott-Automation Group), McMichael Radio, Ltd., Rank Cintel, Ltd., Southern Instruments (Contracts), Ltd., and W.S. Electronics, Ltd. (a member of the K.G. Holdings Group). W.S. Electronics, Ltd., have been appointed to act on behalf of the consortium in negotiations with U.K. and overseas Governments and with other interested bodies.

The system has a range of 100 miles or more in line of sight, and transmits aircraft flight information to ground stations, where it is presented as meter displays, pen recorder traces, and in digitised form for feeding into computers. It is already in operational use, many airborne transmitters having been supplied for operation with the associated ground equipment.

Engineering Production

Production in the engineering and electrical goods industries continued to expand steadily during the summer months. The Board of Trade provisionally estimate that in August it was 8 per cent more than a year earlier. This increase was the same as in the three months May to July.

New orders were received by the wider engineering and allied group, which includes these industries, and locomotives and heavy commercial vehicles, at a slightly higher rate in July and August than in the second quarter and well above the rate a year earlier, but less than the particularly vigorous inflow in the first quarter of this year.

Cheaper Mercury-Fluorescent Lamps

A reduction in the price of their 250 W MBF/U colour-corrected mercury-fluorescent lamps from £4 19s to £4 4s as from 1st November is announced by Philips Electrical, Ltd. The price of 250 W MBFR/U lamps has been reduced from £6 to £5.

Similar reductions have been made by the Stella Lamp Co., Ltd.

£60 Million Steel Project

THE Iron and Steel Board has approved proposals by the Park Gate Iron & Steel Co., Ltd., a subsidiary of Tube Investments, Ltd., for the development of a new integrated works on a site adjacent to the existing Park Gate Works near Rotherham. The proposals are designed to meet the increasing needs of the T.I. group and those of Park Gate's traditional trade. They have also been planned to accommodate future modernisation of the existing steelworks in perhaps 10 to 15 years' time.

The new works will use home ore and will initially include ore preparation plant, one blast furnace, a steel-making department producing steel by

the "Kaldo" process and an electric furnace, and a blooming mill followed by a continuous billet mill. Finishing plant will include a roin continuous rod and bar mill and a continuous narrow strip mill, which will be sited near to the existing 11in continuous bar mill installed in 1953.

The new works will cost between £55 million and £60 million, and will produce about 425,000 ingot tons a year. The main engineering consultants will be the International Construction Co., Ltd., and Bylander, Waddell & Partners. Work will start in 1961, and the plant will be commissioned early in 1964 and be in full operation by 1965.

COMPUTER FOR YORKSHIRE ELECTRICITY BOARD

The Yorkshire Electricity Board is to install an English Electric KDP10 electronic data processing system.

The present intention is to centralise the consumer accounting work of the seven sub-areas replacing existing punched card installations by automatic electronic systems. For about half of the working day KDP10 will be employed on the processing of data related to about 25,000 consumer accounts and printing out the bills ready for dispatch. This will include balancing and posting the cash receipts associated with the accounts and automatically producing reminder notices when cash is overdue. Also as part of this daily task KDP10 will produce information on a wide variety of matters such as the consumption by each class of consumer and statistical analyses which will be invaluable to the Board for operational purposes and in formulating future policy. Consideration will also be given to the application of the computer to other functions.

Applied Electronics Laboratory



Climatic test equipment at the G.E.C. Applied Electronics Laboratory at Portsmouth

THE new Applied Electronics Laboratory of the General Electric Co., Ltd., at Portsmouth was officially opened on 21st October by Mr. Peter Thorneycroft, Minister of Aviation. The laboratory is one of a group of three operated by the company on behalf of the Ministry of Aviation and is engaged on research and development on electronic equipment for defence purposes. The laboratory was originally established at Allesley, Coventry, in 1950, and the transfer of staff and equipment to Portsmouth was completed in August this year.

Two of the principal developments in the laboratory have been the guidance equipment for the ship-to-air weapon "Seaslug" and the airborne radar for the Royal Navy's aircraft, the "Sea Vixen." Both projects are successful and are giving highly satis-

factory results. A feature of the laboratory is the extensive range of mechanical and climatic test equipment which is used to test prototype equipment to ensure that it will operate successfully throughout its service life.

Board's New Offices

A contract worth approximately £765,000 has been awarded to J. Gerrard & Sons, Ltd., by the North Western Electricity Board for the demolition of existing buildings in Dickinson Street, Manchester, and the erection of a nine-storey office block, an entrance block and a substation. The project is due to be completed in October, 1962. The architects are Harry S. Fairhurst & Son.

NEXT YEAR'S RADIO SHOW

The 28th National Radio and Television Exhibition is to be held at Earls Court, London, next year, from Wednesday, 23rd August, to Saturday, 2nd September. It will mark the silver jubilee of television programmes, which were first seen at "Radiolympia" in 1936. The exhibition is organised by Radio Industry Exhibitions, Ltd., of which Mr. F. W. Perks is chairman.

Domestic Refrigerator Sales

The demand for domestic refrigerators fell sharply during September, according to the figures issued by the Domestic Refrigeration Development Committee. Manufacturers' deliveries to the home market, a total of 27,248, were substantially lower than in September last year, when they totalled 77,106. Total deliveries to the home market of domestic refrigerators from January to September inclusive are, however, still 20 per cent higher than those for the same period in 1959 (832,586 compared with 694,534). Exports continue to be good. September deliveries of domestic refrigerators to the export market, a total of 11,571, show an increase of 40 per cent on September last year, when the figure was 8,250. The total for the first nine months of the year is 107,104—nearly 42 per cent higher than in the same period of 1959.

INDUSTRIAL NEWS [continued]

Power Engineering Research in India

THE establishment of a power engineering research organisation with laboratory facilities at Bangalore and Bhopal in India is planned under an agreement recently reached with UNESCO.

The proposed unit at Bangalore is intended to take up research on technical problems concerning the electric power supply and electrical equipment manufacturing industries, in the fields of high voltage and electrical, mechanical and hydraulic engineering. The unit at Bhopal would provide facilities for work on high current phenomena and for short circuit testing, develop-

ment and standardisation of switchgear. It is intended that the set-up at Bangalore would function in close collaboration with the Indian Institute of Science, and the unit at Bhopal with the Heavy Electricals Plant which has been set up by the Central Government in collaboration with Associated Electrical Industries, Ltd.

The total cost of the scheme spread over a period of seven years has been estimated at about £4 million and it will be operated by the Power Wing of the Central Water and Power Commission under the Ministry of Irrigation and Power.

C.E.G.B. CONTRACTS

DURING the past month the Central Electricity Generating Board has placed contracts for power stations, transmission lines and transforming stations amounting in the aggregate to £4,652,000. They include the following:—

Thorpe Marsh power station: Aluminium wall cladding.—Freeman Morrison. Structural steelwork for turbine house and boiler house for No. 2 unit set.—Alex Findlay & Co.

Trawsfynydd nuclear power station: 275 kV and multi-core cables and accessories. — Pirelli-General Cable Works.

Blyth "B": Coal handling plant.—Birtley Engineering.

West Thurrock: Chimney for Nos. 3 and 4 boilers.—Tileman & Co. 3.3 kV switchgear extension for units Nos. 3 and 4.—English Electric Co.

Bankside: One 136 MVA generator transformer. — Associated Electrical Industries.

Richborough: Structural steelwork for units 1 and 2.—Dawnays.

Barking "C": 132 kV, 3,500 MVA switchgear.—A. Reyrolle & Co.

Barking substation: Four 180 MVA, 275/132 kV transformers.—Ferranti.

Northfleet power station and substations: 132 kV, 3,500 MVA switchgear.—English Electric Co.

Bustleholm substation: 275 kV and 132 kV switchgear.—Associated Electrical Industries.

Kingston-Chessington: 132 kV and auxiliary cables.—British Insulated Callender's Cables.

Iver-West Weybridge: 132 kV cables at London Airport.—British Insulated Callender's Cables.

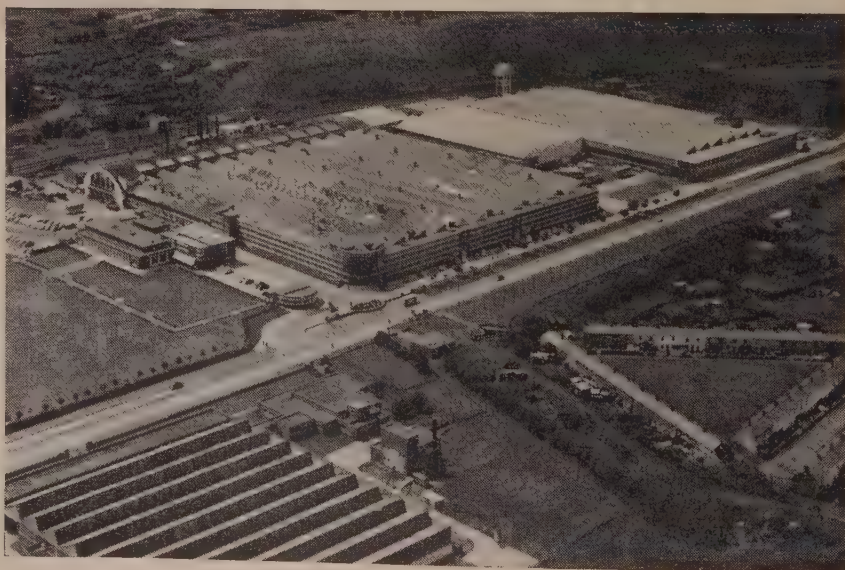
Benjamin Wholesalers' Conference

THE second of the series of conferences organised by the Benjamin Electric, Ltd., for electrical wholesalers' sales representatives took place at the Benjamin works on 20th and 21st October when representatives of the following concerns in the Midlands attended:—Coventry Factors, Ltd., Edmundsons (Midlands), Ltd., Electrical Components, Ltd., Newey & Eyre, Ltd., and A. J. Wright (Electrical), Ltd. Representatives of the General Electric Co., Ltd., and Crompton Parkinson, Ltd., also took part. Those attending were shown the manufacture of all types of industrial and commercial lighting fittings, and they discussed problems and technicalities of illumination, co-operation in the field, industrial lighting application, etc. At the end of the second day Mr. J. O. K. Purdey, the company's sales director, and other Benjamin people answered questions and discussed problems.

A.S.E.E. Events

The annual dinner and reunion of the Association of Supervising Electrical Engineers is to be held at Grosvenor House, London, W.1, on 7th April next. Tickets: members £1 15s, others £2 2s. The Association's 1961 annual conference will take place at Brighton from 19th to 21st May.

New Hoover Factory



A 110,000 sq ft factory extension for Hoover (Washing Machines), Ltd., has recently been completed. The photograph shows the group of Hoover factories at Pentrebach, near Merthyr Tydfil, with the latest extension in the top right-hand corner. This expansion represents some £2,000,000 capital value in building and equipment

PRESTCOLD ACTIVITIES

An outline of a new marketing plan was given by Mr. D. A. Field, sales director of Prestcold (Division of the Pressed Steel Co., Ltd.) at the recent opening of a new branch at 30, Barbourne Road, Worcester. He said that during the next three years Prestcold intended to acquire the businesses of their distributors in England and, in their place, create regional marketing units. In due course the factory at Swansea would make not only commercial and domestic refrigerators, but other appliances.

The Hanover Fair

Introducing a recent showing in London of a documentary film on the Hanover Fair, Dr. Max W. Clauss stressed the international character of this annual display, now claimed to be the largest industrial exhibition in the world. Dr. Clauss said that 840 of the total number of stands, 4,700, were non-German; 98 British firms participated, in addition to 16 who took part in the biennial German Aviation Show at Hanover Airport. Of the British firms 41 were in the mechanical engineering industry and 30 were electrical.

Short-Circuit Calculations

A booklet dealing with simplified short-circuit calculations related to group motor control and distribution switchboards operating at 400-600 V has recently been published by the Belmos Co., Ltd., of Bellshill, Lanarkshire, price 5s. The 28-page book, by Mr. R. T. Lythall, includes a general introduction on the effects of short-circuits at or beyond such switchboards, and discusses the equivalent reactance of the h.v. network, the reactance values of transformers, the resistance and reactance of multi-core cables and the reactance of single-core cables and bare copper conductors, concluding with a section on the short-time rating of cables. There are a number of worked examples and information on the subjects covered is given in tabular form. A chart is included showing the symmetrical short-circuit current ratings for paper-insulated cables based on information supplied by British Insulated Callender's Cables, Ltd.



General view of the new G.E.C. nuclear clean workshop showing reception bay roof open and a crane about to lift a component into the assembly area

Nuclear Clean Workshop

A NUCLEAR clean workshop has been constructed at the Erith works of the General Electric Co., Ltd. Plant destined for use in the gas circuit of a nuclear reactor must not only be handled carefully during installation on site but the same care must be exercised during all stages of manufacture. This control commences when the parent metal enters the factory and follows the component throughout its manufacture, culminating in a final cleaning, preserving and

packing operation in the nuclear clean workshop.

The workshop has been constructed in part of the Erith process and preservation shop. The existing building has been partitioned into two; a false ceiling and a reception bay with a sliding roof have been provided in the clean workshop area. There is also a personnel entrance room which together with the assembly area and reception bay are pressurised to prevent the entrance of foreign matter.

The workshop has dimensions of 85ft 6in by 42ft 6in by 30ft high and the air filter system is capable of handling 35,000 cu ft/min. Ventilation plant was supplied by J. Jeffreys & Co., Ltd., and a vacuum cleaning plant has been provided by the Sturtevant Engineering Co., Ltd.

LARGE A.E.I. ORDERS

ASSOCIATED Electrical Industries, Ltd., has received an order from the Central Electricity Generating Board for four 75 MVA three-phase transformers for a substation at Templeborough, Sheffield. They will step down the 275 kV supergrid voltage to 33 kV for supplying the six 40 MVA arc furnace transformers for steel melting plant to be installed as part of a £10 million scheme by the Steel, Peech & Tozer branch of United Steel Companies, Ltd. The value of the contract is about £415,000.

Switchgear for extensions to existing C.E.G.B. stations at Aberthaw (Glamorgan) and Swansea North has also been ordered from A.E.I. Seven 132 kV air-blast circuit-breakers and

control equipment, with three power station auxiliary switchboards and associated relay panels, are included in the £300,000 order for Aberthaw. The £250,000 Swansea order is for nine 132 kV oil circuit-breakers with ancillary equipment.

School of Welding

The 1961 prospectus of the School of Welding Technology at the Institute of Welding, 54, Princes Gate, South Kensington, London, has just been published and copies may be obtained from the Institute. Each course covers five days and is concerned with a particular aspect of welding.

ALUMINIUM SCRAP

Details of the standard classifications of aluminium and aluminium alloy and a segregation schedule are given in a pamphlet, copies of which are obtainable from the Association of Light Alloy Refiners & Smelters, Ltd., 3, Albemarle Street, London, W.1.

Change of Name

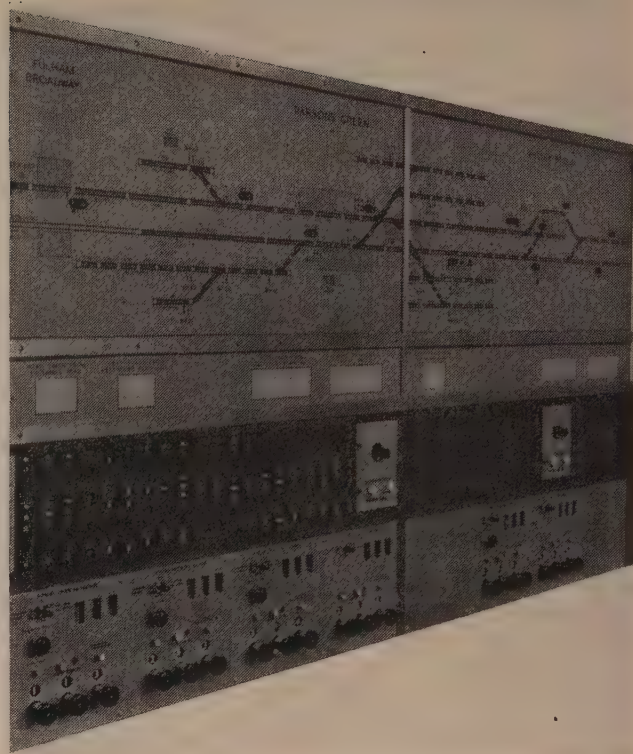
The name of Precision Components (Barnet), Ltd., has been changed to Kabi (Electrical & Plastics), Ltd.

INDUSTRIAL NEWS [continued]

District Line Signalling Improvements

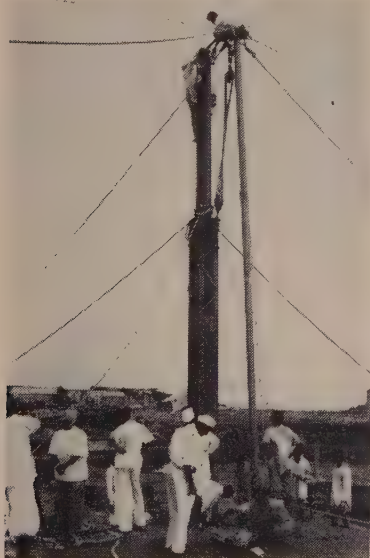
THE signalling on the District Line of London Transport from Earls Court to Putney Bridge is being modernised and the junction and point mechanism has been arranged for automatic operation by programme machines. These are basically the same as those introduced on the Northern Line and at Watford (Metropolitan Line) in 1958, but the identification of all trains on the programme rolls is now by train number. This is punched on the roll in the form of a decimal-binary code used for reference purposes. Most of the daily train movements can be predicted but there are occasional variations in the pattern of traffic working into and out of the sidings, and a shunt "siding allocation panel" has been provided to cover this. The panel is arranged to give a means of pre-setting the required movements. A supervision room from which the normally automatic signalling at Parsons Green and Putney Bridge can be controlled in emergency by push-button operation has been built at Earls Court. In

connection with the new signalling arrangements, the signal boxes at Parsons Green and Putney Bridge are being closed and replaced by interlocking machines of the standard London Transport type housed in specially-built relay rooms at the stations concerned. The interlocking machines are themselves controlled by programme machines housed in the same rooms.



The supervisory panel at Earls Court, incorporating signalling and programme machine controls and a track diagram

INDIAN CABLE FACTORY



Indian workmen garlanding the first stanchion to be erected on the site of the new Poona factory of Henley Cables India, Ltd. The factory, which will at first manufacture rubber and plastic insulated cables, is being built on a forty-acre site on the Hadapsar Industrial Estate

New Films

"HEAT of the Game" is the title of a 16 mm colour film with commentary by Frank Phillips, announced by the General Electric Co., Ltd. It describes the installation of soil warming cables at Murrayfield, the headquarters of the Scottish Rugby Union, the ease with which the specially designed tractor-drawn mole plough cuts the slots into the turf and lays the cable in one operation being clearly illustrated. Details of the electrical installation, the main switchboard and the automatic temperature control gear are given and a striking "shot" of the ground cleared of snow is shown. Application for the free loan of this film should be made to the G.E.C. Industrial Heating Division, Magnet House, Kingsway, W.C.2.

A new 16 mm colour film, "The

Brook," announced by Brook Motors, Ltd., is the story of a Yorkshire river and of some of the industries it passes as it is traced from a moorland stream to the sea. Interesting manufacturing sequences are seen at several factories, including such items as candle, tennis racket, textile, electric motor and tractor production. The film, produced by the Brook Motors film unit, has a running time of 28 minutes. It is available on free loan on application on the company's Publicity Department at Empress Works, Huddersfield.

Honeywell Controls Expansion

Plans for a factory expansion on the Newhouse industrial estate at Motherwell, Lanarkshire, have been announced by Honeywell Controls, Ltd. The Board of Trade has approved a proposal to increase the existing 190,000 sq ft area factory to some 350,000 sq ft. This will necessitate an increase in the present labour force of 2,000 by about 50 per cent. In addition, a 40,000 sq ft office block and a new canteen will be built. The new project is expected to cost about £500,000 for the buildings and a similar amount for machine tools and other equipment.

Data Processing Equipment

A second "Leo" computer has been installed at the offices of the W. D. & H. O. Wills branch of the Imperial Tobacco Co. at Bristol. It has a 16,000-word magnetic core store controlled by transistorised circuits and will first extend the cover of sales statistics provided by the original computer to embrace the whole of the United Kingdom.

For your lighting schemes



Simplex **discon means** **plug-in adaptability**

Adequate lighting is a priority consideration for peak production, and it is essential that lighting systems should be as flexible as layout changes demand. Liberal planning with Simplex Discon will ensure this flexibility and avoid costly installations later. The Discon is simple to install, simple to remove. By slackening a locknut, the entire assembly—reflector, lampholder and lamp can be released, leaving the wiring intact.

The Simplex Discon is made for a lifetime of heavy service in extra strong, corrosive-resistant aluminium alloy and has silver plated plug contacts suitable for 15 amps. It is electrically finger safe, too, with colour coded connections. For full details of the Discon, please write to Simplex Electric Company Limited, Lighting Dept., Creda Works, Blythe Bridge, near Stoke-on-Trent, Staffordshire.

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INDUSTRIAL NEWS {continued}**B.E.A.M.A. Collective Exhibit at Cologne Fair**

THE British Electrical and Allied Manufacturers' Association are to stage, in co-operation with the Board of Trade, a collective display of domestic electrical appliances at the International Household Goods and Hardware Fair, Cologne (24th to 27th February, 1961).

The Cologne Fair is accommodated in 10 halls covering an exhibition area of more than 90,000 square metres. Next February there will be 1,650 exhibitors, including 350 from outside Germany, and the Fair authorities are confidently expecting a record 60,000 buyers and other trade visitors from Germany and 64 other countries. The collective British stand comprising three adjoining islands will be in a prominent position near the main entrance and information centre of the Fair.

Mr. Stanley F. Steward, Director of the B.E.A.M.A., states: "We are determined to make this collective exhibit at Cologne one of the spearheads of our continuing drive to do more business in the European market. It is a sign of our confidence in the long-term prospects for British domestic electrical appliances, and we have urged the Government to help us in our export efforts by creating the necessary foundation of stability in credit controls at home, as this factor is so important in keeping down unit costs of production."

The Survey of the European Common Market for electrical products recently carried out by the B.E.A.M.A. estimates that over the period 1959-63 the total value of domestic electrical equipment to be purchased or installed in the six

countries of the Common Market will be of the order of £1,900 million. About one-fifth of British electrical exports are despatched to European countries, the major markets being the Netherlands, Sweden and West Germany. Domestic electrical appliances closely follow radio and electronic apparatus as leading commodities in these exports.

The following firms are participating in the collective British exhibit: Berry's Electric, Ltd., Corfield-Sigg, Ltd., Dimplex, Ltd., Electrical Division of Radiation, Ltd., the English Electric Co., Ltd., the General Electric Co., Ltd., Heatrae, Ltd., Simplex Electric Co., Ltd., and Thorn Electrical Industries, Ltd.

T.I. Sales Conference

The Tube Investments Electrical Division held a sales conference for three of its companies at the Grand Hotel, Folkestone, from 18th to 23rd October. The combined sales force of the Simplex Electric Co., Ltd., Mersey Cable Works, Ltd., and the Power Centre Co., Ltd., were addressed by Mr. E. G. Plucknett, managing director, and Mr. J. D. Johnson, commercial director, of the Electrical Division. Sir David Watherston, director of personnel, T.I., was a guest speaker at the conference.

Export Prospects and Europe

The analysis of the prospects for British exports in the October issue of the *G.E.C. Export Guide* shows that for the fourth successive quarter, that is for the whole of 1960, there are no "bad" spots among Britain's major overseas markets. In the last quarter of 1960 the outlook is "good" in 23 countries, "improving" in six and "deteriorating" in five. The last group includes the United States, Venezuela and Belgium. The opportunities for British exports have been better in 1960 than in any of the previous three years since the *Export Guide* was started.

PROPOSED NEW PLESSEY FACTORY ESTATE

The Plessey Co., Ltd., states that it has entered into the final stages of negotiations to take over the old 66-acre R.A.F. Balloon Barrage Station near Titchfield, Hants. An application for planning permission has been made and as the site is not zoned for industrial purposes the application has to be referred to the Ministry of Housing and Local Government.

When negotiations are completed, it is estimated that an initial labour force of 600-700 will be required, building up to some thousands. It is hoped to recruit labour almost entirely from local sources and to start production before the end of 1961. Work undertaken at this new Plessey production centre would include the manufacture of components for a wide range of industries.

HIGHER CAPITAL INVESTMENT IN SOUTH WEST

The South Western Electricity Board has been authorised to invest about £6.7 million in extending and improving its distribution network during 1961-62—£1.6 million more than the approved capital investment for the current year. Mr. A. N. Irens, chairman, announcing this at Exeter recently, said that the special difficulties facing the West Country had been recognised by the Government. The extra capital investment should enable the Board slightly to increase the rate of rural development and the prospects for the four years 1962-66 were also improved.

Mobile Showroom

A MOBILE showroom in the form of a 27ft long trailer will shortly begin a series of tours to demonstrate the switchgear, transformers, capacitors and cables manufactured by Johnson & Phillips, Ltd. In addition to the exhibition space there is reception accommodation and a small kitchen, while one side of the showroom can be opened to form a covered verandah. The first tour will be in the North Western Electricity Board area where air-insulated and compound-filled metalclad gear incorporating the 400/800 and 1,200 A Type PDB arc-control

circuit-breakers, the Type SX/F compound-filled oil switch and the Type D expulsion fuse switch for three-phase overhead line systems up to 150 MVA at 11 kV will be displayed.



Johnson & Phillips mobile showroom

INDUSTRIAL NEWS [continued]**New Indian Cable Company**

Consent has been received from the Government of India for the formation of a new cable manufacturing company, Wandleside-National Conductors, Ltd., with factories in Bombay and Poona for the manufacture of wires and insulated conductors. The partners are Wandleside Cable Works, Ltd., of London (a member of the Falks Group), and National Electrical Industries, Ltd., Lalbaug, Bombay.

PETBOW IN AUSTRALIA

Pye Industries, Ltd., of Australia, and Petbow, Ltd., of England, announce the joint formation of an Australian company, Petbow Pty., Ltd. The new company will have a nominal capital of £250,000 and will operate from premises at 288, Huntingdale Road, Huntingdale, Victoria. The operations of the plant in Australia will be gradually extended to cover the whole Petbow range of equipment and also the manufacture of Magnicon alternators under licence to the Macfarlane Engineering Co., Ltd.

SOUND SYSTEM IN LAGOS PARLIAMENT

Standard Telephones & Cables, Ltd., have supplied the complete sound reinforcement and simultaneous interpretation system for the National Hall, Lagos, the meeting place of the Legislative Assembly of the Federation of Nigeria. The Hall has a ground floor and balcony and will ultimately seat 2,000 people.

PRICES OF MATERIALS

In the accompanying table we give the basis prices of the more important materials used in the electrical industry. The figures given are the selling prices and are those quoted on Tuesday last.

ALUMINIUM ingots	ton	£186	0s	0d
COPPER, H.C. Electro	ton	£218	10s	0d
Fire Refined 99.70%	ton	£217	0s	0d
Fire Refined 99.50%	ton	£216	0s	0d
COPPER Tubes	lb	2s	1½d	
Sheet	ton	£251	15s	0d
H.C. wire and strip	ton	£269	15s	0d
LEAD, English	ton	£68	5s	0d
Foreign	ton	£67	0s	0d
MERCURY	flask	£70	10s	0d
TIN, block (English)	ton	£796	0s	0d
ZINC, G.O.B. Foreign	ton	£88	10s	0d
BRASS Tubes (solid drawn)	lb	1s	9½d	
Wire	lb	2s	7½d	
PHOSPHOR BRONZE				
Wire	lb	3s	11½d	
PLATINUM	oz	£30	5s	0d
RUBBER, No. 1 R.S.S.				
spot	lb	26½d—26¾d		

Investment in Electricity

IN a White Paper on public investment in Great Britain published on Tuesday details are given of various investment programmes for the next two years. Of a total of £1,710 million for 1960-61, some £337 million will be spent on electricity generation, transmission and distribution. The corresponding figures for 1961-62 are £1,730 million and £358 million, the latter figure representing an increase of £21 million.

Expenditure on conventional generating stations in England and Wales for 1960-61 will amount to £105 million and for 1961-62 to £97 million while for nuclear stations the figures are £53 million and £58 million.

The payment to the Atomic Energy Authority for initial fuel charges and reserve fuel stocks for the nuclear

stations will rise from £6.5 million for both the current year and for 1960-61 to £13.6 million in 1961-62.

Expenditure on conventional generation by the South of Scotland Electricity Board of £4.5 million in 1960 and £6 million in 1961 is mainly on the Kincardine station, but the 1961 figure includes £1.6 million for the 56 MW extension to the Braehead station. Progress payments of £5.5 million will be made in 1961 on the Hunterston nuclear station compared with £9.7 million in 1960.

The expenditure on generation by the North of Scotland Hydro-Electric Board in 1961 will amount to £11.7 million as compared with £7.8 million this year, the rise reflecting the progress of work on the Loch Awe and Strathfarrar schemes.

TRADE ANNOUNCEMENTS

Price reductions for two Scharpf spin dryers have been announced by **Denham & Morley, Ltd.**, distributors of all Scharpf appliances in this country. The "Rotadry II" has been reduced in price from 20 guineas to 16 guineas (£14 3s plus £2 13s tax), and the "Rotadry IV" from 28 guineas to 22½ guineas (£19 19s 6d plus £3 13s tax). Service and maintenance arrangements for Scharpf appliances are being changed and Continuous Viewing, Ltd., will not service these machines after 31st December next. New arrangements are being made.

Philco (Great Britain), Ltd., announce that their address for all Sales Office correspondence is now 21, Cavendish Place, London, W.1 (telephone: Langham 9291). The accounts department will remain at 30-32, Gray's Inn Road, London, W.C.1, and inquiries on sales and service should continue to be addressed to the Service and Spares Department, at Romford Road, Chigwell, Essex.

The Automotive, Aircraft and Stationary Batteries Sales Divisions of **Pritchett & Gold and E.P.S. Co., Ltd.**, have been moved from Victoria Street, London, S.W.1, to the company's headquarters at Dagenham Dock, where a new two-storey office block has been built. The full address is Dagenite Works, Dagenham Dock, Essex (telephone: Dominion 0121).

The Cardiff office of **George Ellison, Ltd.**, has been transferred to new premises at 306, Western Avenue,

Llandaff, Cardiff (telephone: Cardiff 72701).

The Research and Development Division of **Cawtell Research & Electronics, Ltd.**, is now at 99, Uxbridge Road, Ealing, W.5 (telephone: Ealing 7585). The Production, Sales and Administration Divisions of the company remain at the head office at Scotts Road, Southall.

On 7th November a new Croydon depot is to be opened by the **A.E.I. Lamp & Lighting Co., Ltd.**, at 111-113, Stafford Road, Wallington, Surrey (telephone: Franklin 1141). The new depot will consist of a showroom, distribution centre and trade counter. Mr. A. P. Judd has been appointed area superintendent at Croydon in succession to Mr. W. Steer who is retiring shortly.

Erskine, Heap & Co., Ltd., after closing the agency arrangements with S. T. Pemberton & Co., Ltd., by mutual consent, have appointed their own technical sales engineer, Mr. P. H. Baggott, 55, Copthall Road, Handsworth, Birmingham, 21, to take charge of sales activities in the Midlands.

The telephone numbers of the Forging Division of **High Duty Alloys, Ltd.**, have been changed to Redditch 4211 (day) and 4162 (night).

Advertisement Correction

In recent advertisements of S. N. Bridges & Co., Ltd., the price of the contractor's kit has been incorrectly given. It should be £23 14s.

PERSONAL AND SOCIAL

News of Men and Women of the Industry

The Minister of Power has re-appointed **Mr. T. E. Daniel**, M.Eng., M.I.E.E., M.I.Mech.E., as chairman of the North Western Electricity Board; **Mr. T. Coates**, M.Eng., M.I.E.E., M.I.Mech.E., as deputy chairman; and **Mr. G. A. Howe**, M.A., LL.B., A.C.A., of Lytham St. Annes, as a part-time member of the Board.

Dr. S. English, F.Inst.P., who retired from executive duties with Holophane, Ltd., at the end of last year, has now relinquished the chairmanship of the company but is remaining on the board. He is succeeded as chairman by **Mr. H. G. Campbell**, T.D., M.A., who has been a director of the company for five years and is managing director of the Benjamin Electric, Ltd. Dr. English joined Holophane in 1927 as head of the Technical and Research Department, subsequently



Dr. S. English



Mr. H. G. Campbell

being appointed technical director. After holding successively the offices of deputy managing director, joint managing director and vice-chairman, he was appointed chairman in 1957.

The 31st annual Motor Show dinner of **Oldham & Son, Ltd.**, was held at the Connaught Rooms, London, on Thursday of last week. More than 450 guests attended, representing the mining, aircraft, telecommunications and electrical industries, as well as those from the car and commercial vehicle fields.

Following the usual custom, Mr. John Oldham, O.B.E., the company's chairman, reviewed current events. Speaking of the present recession in the motor industry, he said that the British motor industry was experienced, tough and bold enough to fight back, whatever the temporary difficulties with which it was confronted. If proof was needed, it was to be found in the forward plans of the industry to spend no less than £300 million on

development, some of which had been earmarked for the commercial market. Other speakers at the dinner were Mr. Humphrey C. Edmonds, O.B.E., Mr. R. E. Allison and Mr. Edward C. Oldham, joint managing director.

The Yorkshire Electricity Board has appointed **Mr. P. C. Phillips**, B.Sc. (Eng.), M.I.E.E., to succeed Mr. J. D. Nicholson as chief engineer on 1st January. Mr. Phillips received his technical training with the L.M.S. Railway and remained as technical assistant until 1939. On demobilisation, he became senior assistant distribution engineer in the Edinburgh Corporation Electricity Department. In 1948 he was appointed assistant chief engineer (planning) with the Merseyside and North Wales Electricity Board and in 1955 became assistant chief engineer (operations). He was appointed deputy chief engineer of the Yorkshire Electricity Board in 1956.



Mr. P. C. Phillips

Mr. C. H. Crowlie, a director of Hoover (Washing Machines), Ltd., has retired on completion of 40 years' service with Hoover. In 1947 he was appointed sales manager for Great Britain and in 1950 joined the board of Hoover (Washing Machines), Ltd. At that time he was transferred to take charge of the export department, becoming export sales manager. In 1953 Mr. Crowlie was given control of the French organisation and was appointed managing director of the French company. Since his return to

Great Britain in 1957 he has been assigned to special duties on behalf of the company.

Mr. L. J. M. Knotts, formerly signal engineer to the Scottish Region of British Railways, has joined Mullard Equipment, Ltd., and will act as the company's technical adviser on the application of electronics to railway signalling and communication systems.

Mr. H. P. Barker, M.Inst.Gas E., M.I.E.E., M.I.Mech.E., M.Inst.T., chairman and managing director of Parkinson Cowan, Ltd., has been elected chairman of the British Institute of Management.

Mr. A. J. Coleman, son of Mr. John P. Coleman, M.I.E.E., chairman of the Gresham Lion Group, Ltd., has been awarded the first prize in the student apprenticeship class of the Engineering Industries Association group apprenticeship competition for 1960, for his paper "A Random Observation Work Study." The prize was presented at the E.I.A. Exhibition at the Horticultural Hall, Westminster, on 18th October, by Lord Davidson, president of the Association.

Mr. J. K. Laughton has been appointed divisional manager, Telecommunications Division, Plessey Co., Ltd. Since joining the Division in 1958 as sales engineer he has been successively sales manager, executive assistant to the general manager, and manager of the Division's advanced development laboratory at West Leigh, Hampshire.



Mr. J. K. Laughton

Before joining Plessey, Mr. Laughton served in the Royal Navy. After early training at the Royal Naval College, Dartmouth, he later specialised in communications and radio warfare. He was promoted to the rank of commander in 1954 and when he left the Navy in 1957 he was Assistant Director of Radio Equipment (Communications) at the Admiralty.

The North Western Electricity Board has appointed **Mr. J. L. Pearce** as district commercial engineer of the

ELECTRICAL WHO'S WHO

Although the demand for the 1960-61 edition of the "Electrical Who's Who" has been very great, copies are still available. The book contains brief biographies of about 9,000 leading men and women in the electrical and allied industries, Government Departments, etc., and an index to their organisations and companies. The price is 35s plus 1s 9d postage

Board's South District, which embraces Cheadle, Cheadle Hulme, Wythenshawe, Northenden and Didsbury. Mr. Pearce was previously with the Board in West Lakeland, leaving in 1957 to become first assistant district commercial engineer in the Consett District of the North Eastern Electricity Board.

Mrs. I. H. Hardwich, M.A., A.M.I.E.E., A.Inst.P., of the A.E.I. Research Department at Trafford Park, has been elected president of the Women's Engineering Society.



Mrs. I. H. Hardwich

After graduating in physics at Cambridge she served a two-year electrical engineering apprenticeship with Metropolitan-Vickers. Mrs. Hardwich is now a member of the Physical Metallurgy Section of the A.E.I. Research Department and last May she also took over the duties of supervisor of women in the department.

The guest speaker at last week's luncheon of the **Batti-Wallahs' Society**, Major H. W. Tilman, D.S.O., M.C., entertained the 120 or so members and guests with a talk on his recent voyage to the Corzet Islands. The journey took him eleven months, during which time he covered 21,000 miles—all in his converted pilot cutter *Mischief* with a crew of five. The speaker, who was introduced by Mr. J. S. A. Bunting (president), was warmly applauded at the conclusion of his address and a vote of thanks was moved by Mr. J. G. Freeborn, a past-president.

The next luncheon will be held on 30th November, when the guest speaker will be Mr. Keith Beken, the well-known marine photographer.

Mr. C. Swindley and **Mr. J. F. Gollings** (chief electrical engineers), **Mr. R. Clarke** (Blackburn branch office manager) and **Mr. E. Anderson** (works manager) have been appointed directors of W. H. Smith & Co. Electrical Engineers, Ltd.

The annual apprentice prize-giving at the Cambuslang (Lanarkshire) factory of **Hoover (Electric Motors), Ltd.**, took place on 20th October when Mr. C. A. Oakley, joint chairman of the British Commercial Apprenticeship Board, addressed the boys and presented the prizes. The chairman for the evening was James D. Fairley, one of the apprentices, who himself

was presented with the craftsmanship prize. The best all-round final year apprentice was J. Brian Duffy, who won the works manager's shield.

The following appointments have been made by Cawkell Research & Electronics, Ltd.:—**Mr. R. D. Stafford, A.M.I.E.E.**, chief engineer, Industrial Division; **Mr. R. Reeves, A.M.I.E.E.**, chief engineer, Special Products Division; and **Mr. D. Parker, B.Sc.**, senior engineer, Special Services. Mr. Stafford is also a director of the company.

Mr. H. I. S. Catherwood, M.A., has joined Sigmund Pumps, Ltd., as sales director. He succeeds **Mr. H. P. Lord**, who has been appointed managing director of International Boilers & Radiators, another company in the Bookers group. Mr. Lord remains a director of Sigmund Pumps.

The North Western Branch of the **Electrical Trades Commercial Travelers' Association** held its annual luncheon at the Lancashire County Cricket Club Pavilion, Old Trafford, on 13th October when the chief guest was Dr. C. Whitworth, Principal of the Salford Royal Technical College. The toast to the Association was proposed by Dr. Whitworth, Mr. R. H. Corlett, national chairman, responding. Mr. F. Foulkes, branch chairman, gave the toast to the guests, to which Mr. S. Barratt replied. A collection realised £29 for the president's charity appeal.

Mr. W. H. Parry, general manager of the High Wycombe Division of the Charles Colston group, has been elected president of the Purchasing Officers' Association for 1960-61.



Mr. D. F. Kershaw

Mr. D. F. Kershaw has been appointed general manager of the Canadian branch of Wolf Electric Tools, Ltd.

Five employees of the **Electric Construction Co., Ltd.**, were recently presented

with savings certificates to mark their fifty years' service with the company. They were Messrs. Joseph Simner, A. Foulkes, J. Wilkins, J. Paddon and W. Price. The presentation was made by the chairman of E.C.C., Mr. Charles Reid.

Mr. Edward Ward, home sales manager of the Electrical Division of Auto Diesels, Ltd., has left to take up

an appointment with Astley Industrial Trust, Ltd. He is succeeded by **Mr. D. L. Sidney**, a former director of Bowler & Sidney, Ltd., who are now members of the Braby of Britain group.

Mr. T. Hannaby has been appointed general sales manager of the Mine Safety Appliances Co., Ltd. Before joining the company he was with the Multitone Electric Co., Ltd., and previously he was on the overseas sales staff of the Automatic Telephone & Electric Co., Ltd., for several years.

On his retirement from the position of chairman of Ever-Ready Razor Products Ltd., **Mr. C. E. Drukker** was recently presented with a silver cigar box by business colleagues at a luncheon at Kettner's Restaurant.

After trade talks in Moscow, **Mr. Hugh D. Binyon**, group product sales director, and **Mr. D. J. Hendry**, export manager, International Division of the Solartron Electronic Group, Ltd., left on 26th October for an extensive tour of the Far East.

Mr. B. A. O. Burgess, B.Sc.(Eng.), until recently the West African representative for Johnson & Phillips, Ltd., has now taken up an appointment with the Ghana Civil Service as electrical engineer at the headquarters of the Electricity Division of the Ministry of Works and Housing at Accra.

After fifty-two years in the electrical industry, **Mr. H. Etchells**, formerly Preston area manager, A.E.I. Lamp & Lighting Co., Ltd., has retired.

Mr. J. E. Wall has been appointed managing director of Electric & Musical Industries, Ltd.

The British Radio Corporation, Ltd., announces that **Mr. H. C. Goodman**, assistant sales manager, Marconiphone Radio and Television, has been appointed sales manager of that Division. He succeeds **Mr. F. Jones**, who is retiring.

Mr. F. J. Edmonds has been appointed general sales controller of Sunbeam Electric, Ltd.

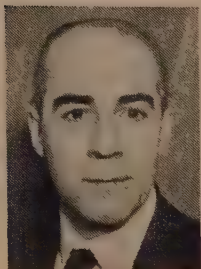
OBITUARY

Mr. M. V. Ratcliffe.—We regret to report the death in an air accident in Brazil of Mr. Maurice V. Ratcliffe, B.Sc.(Eng.), M.I.E.E., M.Cons.E., a consultant to Messrs. Kennedy & Donkin. Mr. Ratcliffe, who was 51, joined Kennedy & Donkin in 1930 and at the time of his death he was in Brazil on a temporary mission in connection with a survey that his firm are carrying out for the Brazilian

Nuclear Energy Commission (*Electrical Review*, 19th August, 1960). Mr. Ratcliffe specialised in electrical transmission and system design.

Mr. J. W. Woodfield.—We also regret to report the death in the same accident of Mr. John W. Woodfield, B.Sc.(Eng.), Grad.I.E.E., aged 28, who was in charge of the team of five Kennedy & Donkin engineers engaged on the Brazilian survey. Mr. Woodfield, who had been in Brazil since last May, joined the firm in 1957.

Mr. C. F. Jackson.—The death has occurred at his home at Kenton, Middlesex, of Mr. Charles Frederick Jackson, a director of Lancashire Dynamo & Crypto, Ltd., and general manager of the company's Willesden factory. He was 56. Mr. Jackson was educated at Paddington Technical College and



The late
Mr. C. F. Jackson

served his apprenticeship with the Cox Cavendish Electrical Co. He joined Crypton Equipment in 1936 and Lancashire Dynamo & Crypto (both companies are now in the Metal Industries Group) in 1941. He was a Justice of the Peace.

Mr. J. Billcliff.—The death occurred suddenly on 22nd October of Mr. J. Billcliff, A.M.I.E.E., organisation research officer of the East Midlands Electricity Board. Mr. Billcliff was born at Barnsley in 1909 and educated at Preston Technical College. After service with the Corporations of Eastbourne and Cheltenham, he was appointed deputy engineer and manager at Nuneaton in 1947. He became manager of the Nuneaton District of the East Midlands Board in 1948, relinquishing that appointment in 1959 to become organisation research officer at headquarters.



The late
Mr. J. Billcliff

Mr. H. A. Lamb, M.I.E.E., general manager and director of Aberdare Cables, Ltd., died on 13th October, aged 53. After war service as a staff captain with the Royal Electrical and Mechanical Engineers, he joined South Wales Switchgear, Ltd., as chief tech-

nical engineer. In 1951 he was appointed general manager of the associated company, Aberdare Cables, Ltd., and later became a member of the board.

Sir Cecil Weir, the well-known industrialist, died on Sunday at his

home in London at the age of seventy. He was chairman of the British Tabulating Machine Co., Ltd., and a part-time member of the British Transport Commission. Recently he served as chairman of the Committee on Gas-Electricity Co-operation appointed by the Minister of Power.

BRITISH TRADE FAIR IN MOSCOW

THE final details of the British Trade Fair to be held from 19th May to 4th June next year in the Sokolniki Park of Culture and Rest, Moscow, were given at a Press conference in London this week. The Fair is sponsored by the Association of British Chambers of Commerce and the All-Union Chamber of Commerce of the U.S.S.R., and organised by Industrial & Trade Fairs, Ltd. Mr. Reginald Maudling, President of the Board of Trade, speaking at the meeting, said that the Government welcomed the initiative and enterprise of the organisers—the Government were not responsible for the Fair but were giving it their wholehearted support. It would, he said, be a good thing for trade (only 1 per cent of United Kingdom exports go to Russia) and a good thing for the development of understanding between the two peoples. This view was also expressed by Mr. Ivan Bolchakov, Deputy Minister of Culture, U.S.S.R., who said the Soviet Union attached a great deal of importance to the exhibition. He also outlined details of a reciprocal exhibition which the Soviet Union were staging at Earls Court, London, from 7th to 29th July, 1961. The purpose of this exhibition, he said, was to let the British people know and see Russian achievements and to widen trade relations between the two countries. Lately there had been a trend to develop trade between the Soviet Union and Great Britain.

Sir James Hutchison, president of the Association of British Chambers of Commerce, said that the British Trade Fair would be the largest foreign fair ever to have been held in the Soviet Union. He said that it was estimated that about a million people would visit the Fair and about 1,200 British subjects would be on the exhibition stands. The entire financial risk of the undertaking had been borne by the exhibition organisers and the cost of participation was being met by the exhibitors. It was not, he said, being subsidised or underwritten in any way from public funds.

Further details of the project were given by Mr. V. G. Sherren, director-

general of the Fair. There will be a total of 621 exhibitors and of these 48 represent the electrical engineering industry, including electronics and radar, radio and television. Most of these companies will be grouped in Hall B. They include A.E.I., Ltd., Automatic Telephone & Electric Co., Ltd., the English Electric Co., Ltd., Hawker Siddeley Brush International, Ltd., Joseph Lucas Export, Ltd., the Pye Group of Companies, Rank Cintel, Ltd., and Standard Telephones & Cables, Ltd. There will also be exhibits by Rustyfa, Ltd., the consortium which has won very large contracts for tyre factories in the U.S.S.R.

The Government exhibit on which the Board of Trade is spending about £100,000 will occupy some 10,000 sq ft in Hall C. The theme of this exhibit will be British achievements in science and technology and it will be designed and managed by the Central Office of Information.

Space Satellite Tracking

A chain of 18 reporting posts is being set up round the world in connection with the tracking of the first American manned space satellite. It is expected that this will be launched some time next year and telemetric data from the satellite and other tracking information will be passed from the stations to a computing centre in the U.S.A. At two of the stations—Kano (Nigeria) and Zanzibar—the point-to-point communications will be provided by Cable & Wireless, Ltd., who are also concerned with providing voice and radio teleprinter channels between another station in Bermuda and the U.S.A.

The first flight is expected to circle the earth three times at a height of 100 miles and a speed of 1,800 m.p.h., the total flying time being some 4½ hours. There will be two-way communication between the pilot and the ground stations during the flight.

Equipment in the capsule will include a two-way radio, a receiver for commands from the ground, telemeter equipment for transmitting data to ground stations and a radio beacon.

Financial Section

STOCKS and SHARES

IN the City there were favourable reactions to first news of the proposed merger between Pye and E. K. Cole and the terms were considered altogether fair and reasonable. The price of Pye 5s shares had eased previously to 15s 6d and was raised subsequently to 16s. "Ekco" 5s shares, for many weeks the subject of various "bid" rumours, had been pushed up to optimistic heights and there was a rather sharp correction to 24s when the preliminary notice was published. Now the two prices are roughly related to the proportions in which it is the intention to exchange each company's shares for those of a new holding company: in effect the ratio is one-and-a-half Pye to one Ekco share. Formal offers are to be sent out as soon as possible.

Market Conditions

Pending some sign of relenting in the Government's attitude towards the credit squeeze, the industrial markets of the Stock Exchange remained in a state of some indecision, while with the aid of the Bank Rate reduction Government securities edged a little further back into favour. Successful issues of gilt-edged stocks on a 6 per cent yield basis evidently caused some people to look again at the wide difference between such returns and those offered by the popular "growth" stocks in the industrial field. In the electrical markets, a satisfactory feature was the continued recovery in the shares of the major groups.

Price Changes

Recovery in the price of A.E.I. shares made further good progress during the week, on a wider acceptance of the view that this year's previous depreciation of over 30 per cent in their value lacked justification. Having risen another 3s 9d to 47s 6d, the price was 5s clear of the recent "low" point. English Electric gained more than a shilling for the second week running, while Parsons and Reyrolle retained earlier gains. In the fields of domestic equipment, electric fires and radiators remained very much in favour, in contrast with washing machines, refrigerators and the other larger household appliances. Dimplex and Berry's Electric Magicoal both moved up to

record levels of 44s and 44s 6d respectively.

Lower prices were quoted for Contactor Switchgear at 15s, following the announcement of an unchanged dividend and lower profits and for Ericsson

Telephone at 21s 6d on news of a coming "rights" issue to raise about £1½ million new capital. Others to lose some ground included I.C.T., Brook Motors, Ultra Electric, Ward & Goldstone and Tube Investments.

Price Changes in

Company or Board	Nom. Value	Week's Middle Rise price or 31st Oct. Fall		Dividend		Yield %	1960		
				Pre- vious	Last		High- est	Low- est	
Gilt-edged Stocks							£	s	d
Brit. Elec. 1968/73	100	74½		3	3	4 0 6	79½	74	
Brit. Elec. 1974/77	100	70½	+½	3	3	4 5 0	76	69	
Brit. Elec. 1976/79	100	73	+½	3½	3½	4 16 0	79½	72½	
Brit. Elec. 1974/79	100	82		4½	4½	5 3 9	90½	81	
Brit. Elec. 1967/69	100	91	+1	4½	4½	4 19 0	97½	90	
Overseas Electric Supply									
Calcutta Elec.	£1	21/-		7†	7½†	11 14 0	21/-	19/3	
East African Power	£1	14/6	-1/-	8	10	13 6 0	20/3	14/6	
Nigerian Elec.	£1	16/3		8	10	12 6 3	19/9	15/6	
Perak Hydro-Elec.	£1	18/9		10	10	10 13 3	21/-	15/3	
Electrical Shares									
Aberdare Holdings	5/-	15/6	-3d	17½	17½	5 13 0	19/-	14/6	
Aerialite	1/-	7/3	-3d	54	54	7 9 0	9/6	7/3	
Allen, W. H.	£1	40/-		12	14	4 13 3*	43/9	34/6	
Allied Insulators	5/-	10/-		—	20	5 0 0*	11/6	9/9	
Anglo-Portuguese Tel.	£1	22/6	-9d	9	9	8 0 0	29/-	22/6	
Arcoelectric	1/-	4/6		—	15	3 6 9	5/6	4/-	
Aron Meters	£1	88/-	-2/-	15	15	3 8 3	90/-	47/-	
Assoc. Elec. Ind. Ord.	£1	47/6	+3/9	15	15	6 6 3	66/6	42/6	
Automatic Tel. & El.	5/-	15/9	-9d	17	17	5 8 0	21/9	15/4½	
Babcock & Wilcox	£1	33/3	-6d	13	9	5 8 3	48/9	33/3	
Bakelite	10/-	56/3		15	17½	3 2 3	62/6	40/-	
Baldwin, H. J.	2/-	2/3		20	—	—	2/6	1/9	
Berry's Electric	5/-	44/6	+6d	20	30*	3 7 6	44/6	29/6	
Bowthorpe Holdings	2/-	8/-		27	18½	4 12 6	11/6	7/9	
Brit. Elec. Resistance	2/-	10/-	+9d	15	17½	3 10 0	10/3	5/6	
Brit. Elec. Traction:									
Def. Ord. "A"	5/-	46/9	-9d	35	40	4 5 6	49/3	42/-	
B.I. Callender's	£1	50/-	-1/3	13½	13½	5 8 0	61/-	50/-	
B.I. Callender's 6% Pref.	£1	18/6		6	6	6 9 9	21/-	18/6	
British Thermostat	5/-	25/-	-6d	35	20*	4 0 0	26/-	21/3	
Brook Motors	10/-	47/-	-1/-	25	25*	4 13 0*	53/6	43/9	
Bulgin, A. F.	1/-	9/6		50	55	3 17 0*	10/3	8/-	
Bulpitts	5/-	19/6		15	16½	4 3 3	23/3	16/9	
Burco Dean	5/-	10/-		18	15½	7 10 0	15/9	10/-	
Cable & Wireless	5/-	17/-	-6d	10	10*†	2 18 9	18/3	14/3	
Chloride El. Storage "A"	£1	74/3	+6d	20	17½*	4 14 3	81/-	65/6	
Clarke Chapman	£1	48/-		13½	13½	5 14 6	63/9	45/-	
Cole, E. K.	5/-	24/-	-3/9	20	22½	4 13 9	31/9	19/9	
Combined Elec. Mfrs.	4/-	8/3		—	12½†	6 1 3	—	—	
Contactur Switchgear	5/-	15/-	-1/3	14	14	4 13 3	17/9	14/6	
Cossor, A. C.	5/-	5/9		5	Nil	—	10/-	5/9	
Crabtree	10/-	32/6	-6d	20	22½†	3 9 3*	39/-	24/-	
Crompton Parkinson	5/-	11/3		14	12½*	5 11 0	15/-	11/-	
Davis & Timmins	5/-	31/6	-1/6	20*	30†	4 15 3	35/-	17/-	
De La Rue	10/-	64/-	-3/6	22½	22½*†	3 10 3	78/6	47/9	
Decca "A"	10/-	43/9	-9d	20	23½	5 7 0	51/3	40/9	
Desoutter	5/-	47/6		21½	30	3 3 3	48/-	37/6	
Dewhurst	2/-	7/9	+3d	20	20	5 3 3	8/6	7/-	
Dictograph Tel.	2/-	8/9		20	20	4 11 6	9/9	7/9	
Dimplex	5/-	44/-	+2/6	—	30	2 16 9*	44/-	22/6	
Dubilier Condenser	1/-	2/9		25	30	5 9 0*	3/3	2/6	
Duport	5/-	25/-	+3/9	12½	17½	3 10 0	30/3	21/9	
E.M.I.	10/-	43/6	-6d	20	17½*	4 0 6	58/9	43/6	
Electrical Apparatus	5/-	17/6		14½	20	5 14 3	18/3	12/9	
Electrical Components	5/-	9/6		15	11½*	6 1 0	13/9	9/6	
Elec. Construction	£1	36/3		9	9	4 19 3	43/-	31/3	
Elliott-Automation	5/-	27/-	-6d	9-3	12½	2 4 6	36/-	19/9	
Enfield Rolling Mills	£1	49/-		15	15	6 2 6	56/-	48/-	
English Electric	£1	35/3	+1/3	14	10*	5 13 6	53/-	32/6	
English Electric 3½% Pref.	£1	11/9		3½	3½	6 7 9	13/-	11/-	
Ericsson Tel.	5/-	21/6	-1/6	13†	13†	4 18 3	28/6	21/6	
Ever Ready	5/-	32/6	-6d	27½	20*	3 1 6	34/6	23/-	
Falk Stadelmann	£1	31/6		10	10	6 7 0	35/9	31/-	

The above quotations are based upon middle prices in the Stock Exchange Daily Official List.

* After scrip issue.

† Free of income tax.

‡ Dividend indicated.

Sangamo Weston, however, moved up well to 25s 6d, and Duport to 25s. International Combustion at 25s 3d reacted favourably to the report of closer liaison between the company and Simon-Carves, with special reference

to work on thermal power plants; and British Electric Resistance were marked up by 9d to 10s after the announcement of higher profits, an increase in the dividend from 15 to 17½ per cent, and a forecast of the maintenance of the

same rate on capital enlarged by a proposed one-for-four scrip issue.

Company News

Crompton Parkinson are raising the dividend for 1959-60 by the equivalent of about 1½ per cent to a total of 12½ per cent, but the announcement of a slight decline in net profits apparently fell short of the more optimistic market expectations for the 5s shares, after rising to 11s 9d, subsequently showed little net change at 11s 3d. The year's net surplus of £1.3 million gives just over twofold cover for the new rate of dividend, on the basis of which the yield on the shares goes up to more than 5½ per cent. The 5s shares of Laurence, Scott & Electromotors were quoted a little lower, at 19s, following an interim report to the effect that increasingly competitive conditions and other factors were likely to affect this year's profits. Maintenance of the dividend at a total of 15 per cent is, however, anticipated.

Pifco Report

At the annual meeting of Pifco Holdings the chairman suggested that the imposition of hire-purchase restrictions was more likely to be beneficial than otherwise to the company's products. In reverse circumstances the tendency was for the retailer to promote the sale of major household appliances at the expense of smaller units. Profits of the group improved moderately in 1959-60, and provided sixfold cover for the increased dividend of 30 per cent. The balance sheet shows more than £600,000 in cash. There remains outstanding £490,000 of the amount paid for the original acquisition of the business, and it is now the intention to reduce this substantially. The 4s shares have risen to 40s since the publication of the report, and show therefore a yield of 3 per cent.

Anglo-Portuguese Telephone

New £1 shares offered by way of "rights" to shareholders of Anglo-Portuguese Telephone have been dealt in at a premium of about 1s 6d on the issue price of 21s, of which the first instalment of 10s was due for payment today (Friday). The company has declared an interim dividend of 3 per cent on present capital, and expects this to be followed by a final of 6 per cent, to include the new issue, so that at an all-in price of 22s 6d (free of transfer stamp) there is a prospective yield of 8 per cent on the shares. Demand for telephone services in Lisbon and Oporto is said to remain undiminished: the number of stations in service increased last year by some 23,600 to 253,500, and had risen to the extent of a further 15,800 by the end of September this year.

Electrical Investments

Company or Board	Nom. Value	Middle price 31st Oct.	Week's Rise or Fall	Dividend		Yield %	1960		
				Pre-vious	Last		High-est	Low-est	
Electrical Shares—continued							£	s	d
G.E.C. ...	£1	35/-		10	10	5 14 3	47/6		33/6
G.E.C. 6½% Pref. ...	£1	20/-		6½	6½	6 10 0	22/3		19/6
General Cables ...	5/-	4/9		15	Nil	—	10/-		4/9
Goblin (B.V.C.) ...	5/-	7/6		7½	12½	8 6 9	13/9		6/6
Hackbridge Holdings ...	5/-	7/3x.c.	—3d	20	20	6 18 0*	8/9		7/3
Harland Engineering ...	5/-	15/6		14	16*	5 3 3	16/3		13/-
Head Wrightson ...	5/-	22/-		20	14*	3 3 9	31/6		20/6
Heatrae ...	2/-	11/3		20	22½	4 0 0	12/3		8/9
Holophane ...	5/-	17/-		26	30	8 16 6	20/6		17/-
Hoover ...	5/-	45/-		60	90	5 0 0*	55/-		39/6
Intl. Combustion ...	5/-	25/3	+9d	30	30	5 18 9	46/9		23/3
Intl. Computers & T. ...	£1	66/3	—5/3	—	10	3 0 3	78/6		61/6
Johnson & Phillips ...	£1	18/3		5	Nil	—	24/-		18/-
Laurence Scott ...	5/-	19/-	—9d	15	15*	3 19 0	25/3		18/-
Lister, R. A. ...	£1	53/-		12½	14	5 5 9	62/-		52/-
Lucas, J. ...	£1	63/6	—6d	10	12½	3 18 9	74/6		61/3
Marryat & Scott ...	2/-	15/-		22½	27½	3 13 3	16/9		14/-
Mather & Platt ...	£1	48/-	—9d	10½	11	4 11 9	59/-		45/-
Metal Industries ...	£1	61/9		14	15	4 17 3	76/3		58/9
Midland Elec. Mfg. ...	£1	60/-		10	12	4 0 0	61/-		53/6
Murex ...	£1	39/-	+1/-	15	20	5 17 0*	45/-		35/6
Newman Ind. ...	2/-	5/-		10	12½	5 0 0	5/3		4/-
Oldham & Son ...	1/-	2/6		17½	17½*½	7 0 0	3/-		1/9
Parsons, C. A. ...	£1	46/3	+3d	8½	9½	4 1 0	59/-		44/-
Philips' Lamps ...	Fl.10	220/-	—10/-	13.3	17	1 11 0	£12½		137/-
Plessey ...	10/-	51/-		15½½	17½	3 6 9	60/-		44/3
Pye ...	5/-	16/-	—9d	12½	15	4 13 9	19/-		14/9
Pyrotenax ...	5/-	54/-		34	40	3 14 0	56/-		44/3
Radiation ...	£1	32/3	—6d	6	12	7 9 0	44/6		32/3
Reliance-Clifton ...	5/-	26/3	—3d	15	15	2 17 3	28/-		22/-
Reyrolle ...	£1	35/9		17½	17½	4 18 0*	52/3		33/9
Richardsons Westgarth ...	10/-	7/6	—6d	8½	8½	10 17 0	14/9		7/6
Sangamo Weston ...	10/-	25/6	+6d	12½	11*	4 6 3	25/6		19/3
Simon Engineering ...	5/-	33/-		—	26.6½	4 1 0	33/-		29/3
Smith (England), S. ...	4/-	15/6		12½	17½	4 10 3	20/-		15/6
Southern Areas ...	£1	15/-	—9d	Nil	5	6 13 3	16/-		13/-
Strand Elec. ...	5/-	13/-		20	14.6*	5 12 0	14/-		10/6
Sturtevant ...	5/-	15/-		15½	15½	8 3 0	24/3		15/-
Sun Elec. ...	5/-	17/6		25	15*	4 5 9	17/6		15/-
T.C.C. ...	10/-	43/6		25	35	5 7 3*	48/3		37/3
Telephone Rentals ...	5/-	22/9		12½	15*	3 6 0	24/-		17/-
Thompson (John) ...	5/-	16/-	—6d	25	20	6 5 0	25/9		16/-
Thorn Elec. ...	5/-	48/9	—9d	20	25	2 11 3	55/6		44/3
Thornycroft ...	£1	22/6		6	6	5 6 9	31/-		22/6
Tube Investments...	£1	85/-	—2/6	20	13½	3 1 3	95/6		65/3
Ultra Electric ...	5/-	15/6	—1/6	20	25	8 1 3	29/-		15/-
Vactric ...	5/-	4/9	—1/9	37½	15	—	43/9		4/9
Walsall Conduits ...	4/-	12/-	—3d	22½	15*	5 0 0	16/-		12/-
Ward & Goldstone ...	5/-	27/9	—1/6	30	35	3 3 0*	31/3		25/6
Watford ...	2/-	8/-	+6d	25	25	5 0 0	14/-		7/6
Westinghouse ...	£1	42/6	—2/-	10	11	5 3 6	59/9		42/6
West, Allen ...	5/-	12/-		12½	12½*	5 4 3	17/-		11/9
Wilkins & Mitchell ...	5/-	15/3	—1/-	17	21*	6 17 9	25/9		15/3
Wolf Electric ...	5/-	13/6	—6d	10	12½	4 12 6	14/9		10/9

REPORTS and DIVIDENDS

Pye and E. K. Cole Merger.—The boards of directors of Pye, Ltd., and E. K. Cole, Ltd., have been giving consideration to the desirability of a merger which they believe would be in the best interests of both companies and their stockholders.

Announcing the terms of the offer to Pye and Ekco stockholders, the boards express their conviction that "considerable benefit will accrue in each case not only to the operating companies themselves but also to their stockholders and employees because of the availability of greater resources and on account of the complementary nature of many of the subsidiaries and associated companies of both groups, and particularly in the many export fields in which both companies are now engaged."

In the event of the merger becoming effective, the identity and individual operation of both groups "will be completely maintained in factories, laboratories and sales organisations under their existing managements."

The merger is planned on the basis that a new holding company, with Mr. C. O. Stanley as chairman and Mr. E. K. Cole as deputy chairman, will be formed and the stock in the two existing companies exchanged for shares in the holding company. The proposed terms are as follows:

For each ordinary stock unit of 5s in Pye one fully paid ordinary share of 5s in the holding company. For every two ordinary stock units of 5s in Ekco three fully paid ordinary shares of 5s each in the holding company. For every 100 5½ per cent cumulative preference stock units of £1 in Pye 105 fully paid 5½ per cent cumulative preference shares of £1 each in the holding company. For every 100 5½ per cent first cumulative preference stock units of £1 in Ekco 105 fully paid 5½ per cent cumulative preference shares of £1 each in the holding company. For every 100 7 per cent cumulative participating preferred ordinary stock units of £1 in Ekco 187 fully paid 5½ per cent cumulative preference shares of £1 each in the holding company.

Negotiations between the two companies have been going on for ten months and are thus not a direct result of the present difficulties which manufacturers of domestic television sets are experiencing. The merger opens up a new field for Pye, which gains access to the plastics and domestic appliance sides of the E. K. Cole business.

Mr. Stanley has said that "there

will be considerable integration in the export field, and quite a lot of our plans for the future will merge. Where we would probably have had each to start new companies alone we will now do it together. But there will be no integration as regards distribution and presentation of our merchandise to the public."

Contactar Switchgear, Ltd., announce a final dividend of 10 per cent, making 14 per cent for the year ended 31st July, 1960. Profit £124,170 (£146,265), before tax of £65,961 (£60,000).

Crompton Parkinson, Ltd., are raising their dividend from the equivalent of 11⅝ per cent to 12½ per cent for the year to 30th June with a final of 7½ per cent. Group profit declined from £2,755,691 to £2,750,567 and after tax of £1,474,500 (£1,438,054) the net profit is down £41,570 to £1,276,067.

British Electric Resistance Co., Ltd., are paying a final dividend of 12½ per cent on capital increased by a one-for-five rights issue, making 17½ per cent for the year ended 31st July last. The previous year's total was 15 per cent. A one-for-four scrip issue is proposed and the board hopes to maintain the 17½ per cent on the increased capital for the current year. Gross profits expanded from £57,473 to £72,179 in 1959-60, and net profits from £29,273 to £38,779.

Bulpitt & Sons, Ltd., announce an interim dividend of 5 per cent (the same).

Firth Cleveland, Ltd., announce an interim dividend of 12 per cent on increased capital, against 10 per cent.

Laurence, Scott & Electromotors, Ltd., announce an interim dividend of 3d per share (the same).

New Companies

John Baggs Electric, Ltd.—Registered 5th September. Capital £10,000. To acquire the business of electrical and general engineers now carried on by John Baggs and Celia Baggs at Relay Works, Station Road, Uppermill, nr. Oldham, as John Baggs & Co. Directors: J. Baggs and Celia Baggs (secretary). Regd. office: Relay Works, Hollins Road, Oldham.

Kerstar, Ltd.—Registered 21st October. Capital £1,000. Electrical engineers, etc. Directors: H. F. Kerins and V. Starcevic. Secretary: P. R. Dibb. Regd. office: 16, Sheep Street, Northampton.

W. Thatcher (Electrical Contractors), Ltd.—Registered 12th October. Capital £1,000. Directors: W. H. Thatcher and Marjorie J. Thatcher, both of Lantern Lodge, Daws Hill Lane, High Wycombe, Bucks. Regd. office: 144/6, Desborough Road, High Wycombe.

Andard-Mount Co., Ltd.—Registered 7th October. Capital £100. Manufacturers of and dealers in general electrical, radio, tele-

vision and other equipment, etc. Secretary: Mrs. M. F. Hillel. Regd. office: 82, Portland Place, W.1.

J. D. Henderson, Ltd.—Registered 7th October. Capital £1,000. Electrical engineers, etc. First directors: J. D. Henderson and J. Walton. Secretary: Ann I. Piper. Regd. office: 25, New Broad Street, E.C.2.

Charles R. Barker, Ltd.—Registered 7th October. Capital £1,000. To acquire the business of an electrical and mechanical engineer carried on by Charles R. Barker at Bishop Auckland, etc. Permanent directors: C. R. Barker and Daisy M. Barker (secretary). Regd. office: 18/19, Southgate Street, Bishop Auckland.

Edison Gill Co., Ltd.—Registered 7th October. Capital £100. Electrical equipment specialists, etc. First directors: H. L. Gill and Lilian E. Gill. Secretary: D. E. G. Gill. Regd. office: Bayton Road, Exhall, Warwicks.

Belclere Co., Ltd.—Registered 6th October. Capital £5,000. To acquire the business, assets and undertaking of that department of Savory & Moore, Ltd., which is concerned with the distribution of acoustic appliances, electrical transformers, etc. Solicitors: Clifford-Turner & Co., 11, Old Jewry, E.C.2.

Streeter & Sparks, Ltd.—Registered 28th September. Capital £100. Electrical engineers, etc. First directors: J. J. Streeter, C. A. Sparks and R. J. Streeter. Secretary: P. Hall. Regd. office: Fern Cottage, Sandy Lane, West Hoathly, Sussex.

Emandelle Electrical Products, Ltd.—Registered 5th September. Capital £100. Electrical engineers, etc. S. Cooper is the first director. Secretary: S. Druce. Regd. office: 57, Blandford Street, W.1.

Ajax Electronics, Ltd.—Registered 16th September. Capital £100. Manufacturers, retailers and wholesalers of electronic devices, etc. Directors: A. J. Shoffren, J. A. H. Spratt and J. E. Johnson (secretary). Regd. office: 84, Southchurch Avenue, Southend-on-Sea.

G. Alexander & Partners, Ltd.—Registered 14th September. Capital £100. Electrical, mechanical, electronic, etc. engineers, engineering contractors and consultants. Directors: G. Alexander, A. J. Spenser-Morris (secretary) and J. Alexander. Regd. office: 52, Brook Street, W.1.

Benelect Fires, Ltd.—Registered 13th September. Capital £100. Electricians, electrical manufacturers, etc. W. Bennett is the first and permanent director. Regd. office: 40, Couchman Road, Alum Rock, Birmingham, 8.

Lynbren Electrical & Trading Co., Ltd.—Registered 9th September. Capital £100. Directors: B. B. Mitchell and Mrs. Sephylyn J. Mitchell. Secretary: Shirley Hart. Regd. office: 782, Seven Sisters Road, N.15.

Fluoromatic, Ltd.—Registered 7th September. Capital £100. Manufacturers of, dealers in and repairers of electrical goods of all kinds, etc. Regd. office: 294, Burton Road, Derby.

Home Distributors, Ltd.—Registered 8th September. Capital £100. Manufacturers of and dealers in electrical appliances, etc. Directors: J. D. Buckley (secretary) and J. C. Gibson. Regd. office: 7, Hastings Place, Lytham, Lancs.

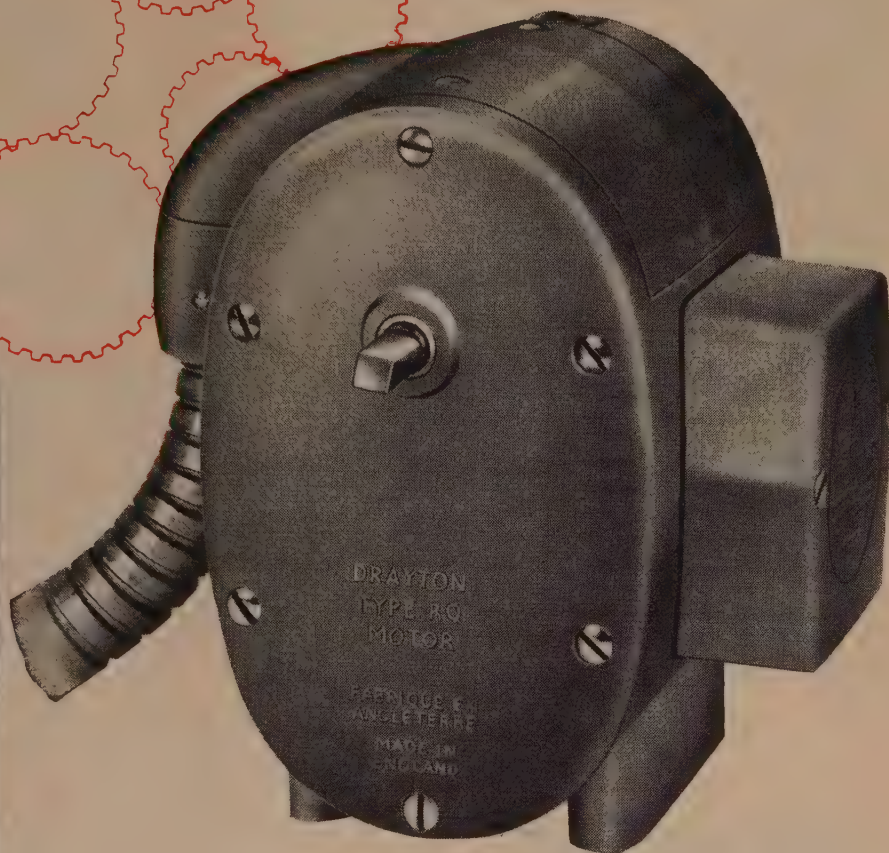
A. Rye & Son (Electrical), Ltd.—Registered 12th September. Capital £1,500. To acquire the business of an electrical contractor, carried on by A. Rye at Wickhambreaux. Directors: A. Rye, D. Owen and S. R. S. Waghorn. Secretary: Sybil G. Rye. Regd. office: The Street, Wickhambreaux, nr. Canterbury, Kent.

H.T. Electrical, Ltd.—Registered 6th September. Capital £1,000. Manufacturers of and dealers in mechanical, electrical, electro-mechanical and electronic equipment, etc. Directors: J. B. Hickman, D. E. T. Tanfield, H. E. Richardson and J. Torbe. Secretary: T. G. Cordes. Regd. office: Kings Works, Stallings Lane, Kingswinford, Staffs.

W. S. Gidney, Ltd.—Registered 19th September. Capital £100. Electrical equipment

(Continued on page 801)

270 *standard speeds*



**57 mins. per rev.
to 2,700 revs. per min.**

**Built-in limit and
programme switches**

**Continuous running
and reversing**

5 types:



RQH

RQ53



RQM

RQU



RQG



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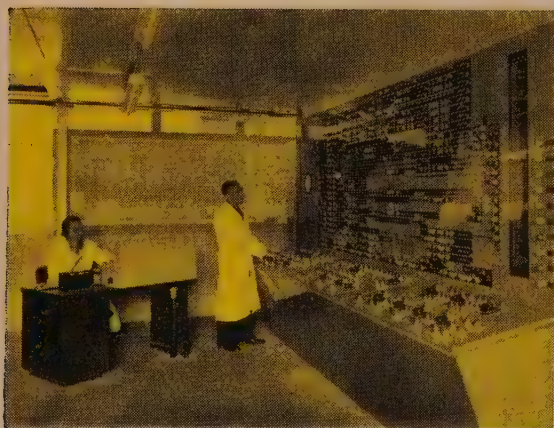
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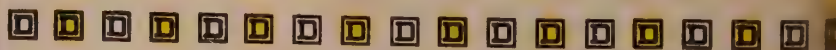


£10 million 48 acre paint trim and assembly plant—
SQUARE D gear controls vital 10 miles of flow line



One of the two control rooms which tracks and controls the movements of car bodies on the automatic transfer system through the paint shop. All breaks and changes in flow are registered and conveyor speeds regulated from this Square D panel.

Square D plays a key part in this new plant—the most advanced of its type to-day. Its selective conveyor system was designed and installed by Geo. W. King Ltd. in co-operation with Ford engineers.



Square D was specified for the plant's complex range of automatic flow line operations. Two central control rooms, together with several local consoles designed and built by Square D, supervise the entire handling system. Hundreds of Square D 2-unit push-button stations and limit switches are heavily worked in this up-to-the-minute example of automation in the motor industry.

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wherever electricity is controlled



oles sited throughout
supplement the two
control rooms. Here the
between primer and
el sections is super-



The system of indexers regulates the flow of bodies over the conveyor bridge and into twin storage lines before the phosphating process. Each line of 11 bodies is fed alternately by automatic selection.

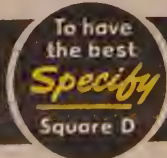
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The principle is simple. A bared-wire regulator, placed successively across the taps of a tap-changing transformer, provides a smooth variation of the interstep voltage. The switching between adjacent taps is done by a pair of selector switches and through a buck-and-boost transformer which, in effect, reverses the polarity of the regulator so that it does not have to be run back at each change.

Quite apart from providing a smooth instead of a

stepped output voltage, the system has other advantages over conventional tap-changing gear. The most important of them is neither the tap-changing nor the selector-switch break power; they simply transfer current: there is no voltage across them at the moment they open. This results in a very much longer contact life; in fact comparative testing shows that this factor alone is a complete justification for using the system.

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FINANCIAL SECTION [continued]

specialists, etc. Directors: W. A. S. Gidney and G. M. Baron. Regd. office: 72, Watling Street, E.C.4.

Rayford Electrics, Ltd.—Registered 8th September. Capital £1,000. Retailers of and dealers in washing machines, spin dryers, etc. Permanent directors: J. Milford and R. Y. F. Horney (secretary). Regd. office: 32, Sydney Street, Brighton, 1.

Cafeteria and Hotel Equipment (Electric), Ltd.—Registered 2nd September. Capital £100. Directors: W. E. Kogel and T. W. McLeay (directors of Cafeteria & Hotel Equipment, Ltd.) and G. F. Sadler. Regd. office: 344, Hillingdon Street, Camberwell, S.E.5.

Roband Value Co., Ltd.—Registered 30th September. Capital £100. Manufacturers of and dealers in electrical, radio, television, mechanical and engineering components, etc. Directors: B. S. Gold and Mrs. Ellen Robinson (secretary). Regd. office: 55-56, Lincoln's Inn Fields, W.C.2.

Ladbroke Electrics, Ltd.—Registered 20th September. Capital £100. Manufacturers of electrical, electronic and lighting fittings, electrical engineers, etc. Directors: F. A. M. Jones and Sylvia L. Jones (secretary). Regd. office: 96, Dawes Road, Fulham, S.W.6.

A. Cleasby, Ltd.—Registered 21st September. Capital £1,000. Electrical engineers, etc. Directors: A. F. Cleasby, Pauline Cleasby, A. J. Cleasby (secretary) and Lucy Cleasby. Regd. office: 196, Deansgate, Manchester.

J. W. Collins & Sons (Hassocks), Ltd.—Registered 21st September. Capital £100. Electrical engineers and contractors, manufacturers of and dealers in radio, electrical and mechanical apparatus, etc. Directors: J. W. Collins, Ethel V. Collins, P. J. Collins and J. M. Collins. Secretary: W. Hollamby. Regd. office: New Place, Keymer, Sussex.

Deimos, Ltd.—Registered 3rd October. Capital £100. Electronic and automation engineers, etc. J. C. Latham is the first director. Secretary: Agnes M. Latham. Regd. office: 8, Corwell Lane, Hillingdon, Middx.

Thorpe Electronics (Egham), Ltd.—Registered 30th September. Capital £1,000. To manufacture, sell, repair and recondition cathode ray tubes, electrical and electronic apparatus, etc. Directors: J. A. H. Steadman and G. J. Benwell (secretary). Regd. office: 26, Ashleigh Avenue, Thorpe Lea, Egham, Surrey.

John B. Woodward (Electricians), Ltd.—Registered 3rd October. Capital £5,000. Electrical contractors, electricians, automobile electricians, radio, television, mechanical, heating and ventilating engineers, etc. Directors: J. B. Woodward and D. M. Davy (secretary). Regd. office: 176, Cherry Orchard Road, Handsworth Wood, Birmingham, 20.

Bobrich (G.B.) Co., Ltd.—Registered 30th September. Capital £100. Domestic, industrial and other kinds of electrical appliance and device engineers, manufacturers, etc. Solicitors: E. F. Turner & Sons, 66, Queen Street, E.C.4.

Brewer & Phillips, Ltd.—Registered 29th September. Capital £5,000. Electrical engineers and contractors, manufacturers of and dealers in radio and television apparatus, etc. First directors: J. F. Hurford, Mildred A. Edmunds (secretary) and W. L. Long. Regd. office: 66, Regent Street, Plymouth, Devon.

Cranborne Electric Co., Ltd.—Registered 26th September. Capital £600. Electricians, etc. Directors: G. Easthope, W. A. Glass and G. H. Hamblett. Regd. office: 94, Smith-down Road, Liverpool.

Arnold Jackson, Ltd.—Registered 22nd September. Capital £100. Electricians, dealers in electrical apparatus, etc. Directors: J. R. Arnold and J. S. Jackson. Secretary: Shirley Hart. Regd. office: "Linden," Shorter Avenue, Shenfield, Essex.

Northern Electrical Connections, Ltd.—Registered 22nd September. Capital £100. Manufacturers of and dealers in electrical connections and electrical and other component parts for the engineering industry;

electrical, mechanical, electronic and general engineers, etc. Directors: F. Newton, H. V. Hird and C. S. Douglas (secretary). Regd. office: 31, Booth Street, Ashton-under-Lyne, Lancs.

G. S. Benson, Ltd.—Registered 20th September. Capital £5,000. To acquire the business of electrical, radio and television engineers and retailers carried on by G. S. Benson at Immingham and Grimsby. Directors: G. S. Benson and Elsie M. Benson. Secretary: Ruth Slowe. Regd. office: 405, Pelham Road, Immingham, Lincs.

Increases of Capital

W. H. Sanders (Electronics), Ltd.—Increased on 15th March by £225,000 in 92,000 7½ per cent cumulative preference shares of £1 and 1,330,000 ordinary shares of 2s each, beyond the registered capital of £25,000. Converted into a public company on 15th March, 1960.

Johnson British Electric, Ltd.—Increased on 9th March by £38,000 in £1 ordinary shares, beyond the registered capital of £12,000.

Display Electrics, Ltd.—Increased on 25th February by £4,500 in £1 ordinary shares, beyond the registered capital of £500.

Geo. W. Glascock & Co., Ltd.—Increased on 16th March by £1,000 in £1 ordinary shares, beyond the registered capital of £1,000.

Boulton Electrical Services, Ltd.—Increased on 3rd March by £3,000 in £1 ordinary shares, beyond the registered capital of £2,000.

Anchor Insulating Co., Ltd.—Increased on 18th March by £54,000 in £1 ordinary shares, beyond the registered capital of £6,000.

Astoria Electrics, Ltd.—Increased on 4th March by £1,800 in £1 shares, beyond the registered capital of £200.

Smiths Electrical Services (Domestic Appliances), Ltd.—Increased on 12th February by £7,000 in £1 ordinary shares, beyond the registered capital of £3,000.

Berbark Radio & Electrical Co., Ltd.—Increased on 16th February by £700 in £1 ordinary shares, beyond the registered capital of £300.

Telomex, Ltd.—Increased on 30th December, 1959, by £6,000 in £1 "A" ordinary shares, beyond the registered capital of £10,000.

Liquidations

Domestic Electrix (Kent), Ltd., retailers of electrical appliances, 59a, High Street, Rochester, Kent.—Liquidator, Mr. H. C. Hedges, 4, Charterhouse Square, London, E.C.1, appointed by creditors on 1st October.

Progressive Engineering Co. (1929), Ltd., mechanical and electrical engineers and contractors, Southern House, Cannon Street, London, E.C.4.—Winding up voluntarily. Liquidator, Mr. F. A. Blake, 19, Fenchurch Street, London, E.C.3, appointed by company on 14th October.

Garjohn Electrics, Ltd., dealers in electrical appliances, 10, Bellevue Road, Southampton.—Winding up voluntarily. Liquidator, Mr. J. F. Johnsen, 8, Bellevue Road, Southampton, appointed by company on 29th September.

W.E.K. (Electrical), Ltd., 124, Chancery Lane, London, W.C.2, manufacturers of and dealers in electrical and radio instruments.—First and final dividend of 3s 7d in the £, payable at the offices of the liquidator, 4, Bucklersbury, Cheapside, London, E.C.4.

Penelectric Appliance Co., Ltd., radio and electrical appliance dealers, 74a, Smeaton Street, North Ormesby, Middlesbrough.—Liquidator, Mr. R. W. Hellyer, Brotherton Chambers, Westgate, Leeds, appointed by members and creditors on 20th October. Particulars of claims to the liquidator by 15th December.

G. Norton & Co., Ltd., electrical contractors, 29, Friar Lane, Leicester.—Winding up voluntarily. Liquidator, Mr. R. A. Haigh,

Court Chambers, Friar Lane, Leicester, appointed by members and creditors on 10th October.

L. P. Tibbitts, Ltd., and L. P. Tibbitts (Radio & Television), Ltd., radio and electrical dealers and engineers, 48, Canterbury Road, Folkestone.—Winding up voluntarily. Liquidator, Mr. R. A. Hawken, Bank Chambers, 1, John Street, Bedford Row, London, W.C.1, appointed by members on 11th October.

Mau-bit Distributors, Ltd., radio and electrical dealers and engineers, 48, Canterbury Road, Folkestone.—Winding up voluntarily. Liquidator, Mr. R. A. Hawken, appointed by members on 11th October.

Renteasie, Ltd., radio and electrical dealers and engineers, 2, Victoria Grove, Folkestone.—Winding up voluntarily. Liquidator, Mr. R. A. Hawken, appointed by members on 11th October.

Cowley (Electrical), Ltd. (creditors' voluntary liquidation).—Particulars of claims to the joint liquidator, Mr. R. A. Hawken, Bank Chambers, 1, John Street, Bedford Row, London, W.C.1, by 15th November.

Apollo Electrical Appliances, Ltd.—Meeting of members 24th November at 9, Mansfield Street, London, W.1, to receive an account of the winding-up by the liquidator, Mr. J. Auerbach.

Bankruptcies

T. G. Davison, electrical dealer, trading as Woolwich Vacuum Supplies, 14, Perry Hall Close, Orpington, Kent.—Receiving order made 17th October on a creditor's petition.

S. L. R. Suckling, formerly carrying on business as Aquatherma at 2, Chelmsley Grove, Tile Cross, Birmingham, as a plumbing and electrical contractor, and formerly carrying on business in partnership with another as R. Taylor & Co., plumbing and electrical contractors, at 53, Jamaica Row, Birmingham; and **L. R. Palmer**, carrying on business in partnership under the style of Roy Stanley & Co., at 67a, New Street, Birmingham, business transfer and estate agents.—First meeting held 28th October. Public examination 7th December at the Court House, Corporation Street, Birmingham.

M. W. Walsh, electrical dealer, 59, Holgate Road, York.—Receiving order made 20th October on a creditor's petition.

Irene May Robinson, residing and carrying on business at 4, Down Hill, High Street, Bagillt, Flint., as Robinson's Radio, T.V. and Electrical Services, and lately carrying on business also at 44, Castle Street, Caerwrlle, Flint., under the same style.—Receiving order made 20th October on debtor's petition.

D. G. Mayell, carrying on business at 82, Park Road, Freemantle, Southampton, as "Electroservice," electrical contractor and domestic appliance retailer.—Last day for receiving proofs for dividend 12th November. Trustee, Mr. R. G. B. Booth, 21, The Avenue, Southampton.

J. S. Sizmore, electrical retailer and contractor, 12, Stoke Road, Slough, Bucks.—First meeting today (Friday) at 58-61, York Terrace, Regent's Park, London, N.W.1. Public examination 25th January at the Law Courts, Windsor Road, Slough.

P. Talbot, carrying on business at 100, Bailey Street, Brynmawr, Brecon, and at 19, Somerset Street, Abertillery, Mon., radio, television and electrical goods retailer.—Trustee, Mr. G. H. Down, 106, Walter Road, Swansea, Glam., appointed 12th October.

R. G. Daniels, electrical retailer, carrying on business as Hayden Television at 51-53, Oxford Road, Windsor.—Public examination 14th December at the Law Courts, Windsor Road, Slough.

J. Jones, electrical dealer, trading as Stanley Electric Supplies of 374, Prescott Road, Liverpool.—Receiving order made 14th October on a creditor's petition. First meeting held 1st November. Public examination 31st January, 1961, at the Court House, 5th Floor, India Buildings, Water Street, Liverpool.

NEW PATENTS

Electrical Specifications Recently Published

The numbers under which the specifications will be printed and abridged are given in parentheses. Copies of any specification (3s 6d each including postage) are obtainable from the Patent Office, 25, Southampton Buildings, London, W.C.2

1955

22179. British Thomson-Houston Co., Ltd.—Valves for gas blast electric circuit-breakers. 1st November, 1956. (850271.)
26886. British Thomson-Houston Co., Ltd.—Electromagnetic contactors. 18th January, 1957. (850641.)
37403. Siemens Edison Swan, Ltd.—Digit translating apparatus. 31st December, 1956. (850341.)

1956

1280. English Electric Co., Ltd.—Transformers. 11th January, 1957. (850645.)
2367. Henley's Telegraph Works Co., Ltd., W. T.—Method of terminating or joining high voltage electric cables. 24th January, 1957. (850517.)
3053. English Electric Co., Ltd.—Domestic refrigerators. 25th January, 1957. (850772.)
4072. Johnson & Phillips, Ltd., and Kitney, S. J.—Gland for armoured electric cable. 16th January, 1957. (850683.)
4242. English Electric Co., Ltd.—Electrical phase discriminators. 8th February, 1957. (850646.)
5785. English Electric Co., Ltd.—Spool valves. 20th February, 1957. (850222.)
6470. Metropolitan-Vickers Electrical Co., Ltd.—Control equipment for transmitting signals in binary form. 27th February, 1957. (850223.)
6841. Pyrotenax, Ltd.—Cable manufacturing apparatus. 18th January, 1957. (850792.)
7024. British Thomson-Houston Co., Ltd.—High speed tripping mechanisms. 27th February, 1957. (850647.)
8136. British Thomson-Houston Co., Ltd.—Dynamo-electric machines. 27th February, 1957. (850793.)
8292. English Electric Co., Ltd.—Electrically propelled vehicles. 11th March, 1957. (850272.)
8600. Electric & Musical Industries, Ltd.—Manufacture of colour television receiving tubes. 20th March, 1957. (850224.)
9456. Electric & Musical Industries, Ltd.—Terminations or attenuators for transmission lines. 11th March, 1957. (850686.)
10009/10. Solartron Electronic Group, Ltd.—Electronic reading apparatus. 25th March, 1957. (850581/2.)
18342. Simplex Electric Co., Ltd.—Electric space heaters. 14th June, 1957. (850225.)
30558. Lueder, H.—Electrostatic precipitators. 8th October, 1956. (850275.)
34820. Siemens Edison Swan, Ltd.—Telephone instruments. 31st October, 1957. (850372.)
36895. Nielsen Co., Ltd., A. C.—Lamp control circuit. 3rd December, 1956. (850588.)
38607. Multitone Electric Co., Ltd.—Transmitters for electromagnetic communication systems. 12th December, 1957. (850526.)
39107. Obergfell, R., and Obergfell, H. (trading as Kieniger & Obergfell).—Electric clocks. 21st December, 1956. (850283.)
39642. Soc. d'Electronique et d'Automatisme.—Electroluminescent compositions. 31st December, 1956. (850592.)

1957

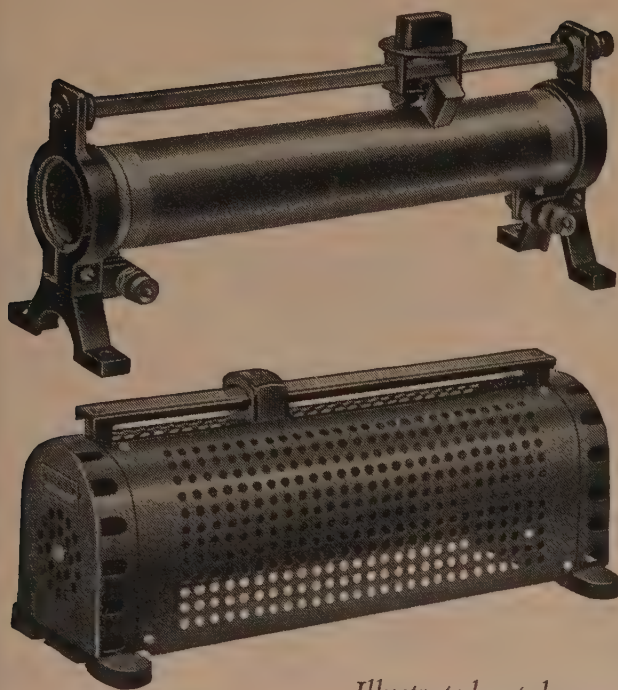
203. Pye, Ltd.—Method of removing impurities in semiconductor materials. 2nd January, 1958. (850313.)
25114. General Electric Co., Ltd.—Methods of metallising surfaces of ceramic bodies. 6th August, 1958. (850191.)
4427. Compagnie Française Thomson-Houston.—Electrical measuring apparatus. 8th February, 1957. (850781.)

5611. Associated Electrical Industries, Ltd.—Magnetic means for deflecting electron beams. 12th February, 1958. (850527.)
9771. Solartron Electronic Group, Ltd.—Circuits embodying electronic counters. 17th March, 1958. (850583.)
16768. Commissariat à l'Energie Atomique.—Magnetic mass spectrometers for separating ionised particles. 27th May, 1957. (850627.)
20200. Landis & Gyr A.G.—Telemetering transmitter for operation by the impulse frequency method. 26th June, 1957. (850654.)
24013/4. Cleveland Electric Motor Co.—Dynamo-electric machines incorporating brakes. 29th July, 1957. (850809/10.)
24039. Marconi Instruments, Ltd.—High voltage supply sources. 9th June, 1958. (850343.)
24596. Siemens-Schuckertwerke A.G.—Surface cooled electric machines for working underground. 2nd August, 1957. (850324.)
25083. Siemens-Schuckertwerke A.G.—Electric machines. 8th August, 1957. (850656.)
27360. Electrolux, Ltd.—Switches for electrically driven devices. 30th August, 1957. (850813.)
27367. Telefunken G.m.b.H.—Electron discharge tubes. 30th August, 1957. (850814.)
31823. Western Electric Co., Inc.—Propagating circuits for crosspoint switching networks. 11th October, 1957. (850211.)
31824. Switching networks for communication systems. 11th October, 1957. (850212.)
31825. Propagator circuits for crosspoint switching networks. 11th October, 1957. (850213.)
31826. Communication switching networks. 11th October, 1957. (850214.)
31992. English Electric Valve Co., Ltd.—V.h.f. electron discharge tubes. 15th July, 1958. (850827.)
35215. General Electric Co., Ltd.—Electric fans. 7th November, 1958. (850327.)
35245. British Insulated Callender's Cables, Ltd.—Prevention of ice formation on high voltage overhead transmission lines. 12th November, 1958. (850612.)
35555. General Electric Co.—Electrode assemblies for electron discharge devices. 14th November, 1957. (850832.)
36728. Central Electricity Generating Board, Ratcliffe, F., Payton, E. J., and Puckey, S. W.—Apparatus for feeding solid material to a pulverising mill. 20th November, 1958. (850699.)
37642. United Kingdom Atomic Energy Authority.—Circuits for sampling oscilloscopes. 2nd December, 1958. (850700.)

1958

4129. I-T-E Circuit Breaker Co.—Gas blast electric circuit interruptors with latch means. 7th February, 1958. (850305.)
4139. Auto Call Co., Ltd.—Magnetically controlled electric switching apparatus. 4th February, 1959. (849945.)
5582. Carr Fastener Co., Ltd.—Electric terminal strips. 2nd February, 1959. (849506.)
5593 and 6793. Allis-Chalmers Manufacturing Co.—Electric circuit-breaker arc exhaust products cooling means. 20th February and 24th October, 1958. (850306/7.)
5801. Siemens-Schuckertwerke A.G.—Methods of manufacturing electric cables. 21st February, 1958. (850743.)
5874. United Kingdom Atomic Energy Authority.—Electrical connection assembly. 23rd February, 1959. (849748.)
6400. Johnson, Matthey & Co., Ltd.—Electric heater elements for furnaces. 23rd February, 1959. (849507.)

6440. Level, B. P. E.—Circuit-breakers. 27th February, 1958. (849993.)
7376. Imperial Chemical Industries, Ltd.—Insulating the end portions of insulated leading wires in a device actuable by the completion of an electric circuit. 27th February, 1959. (849750.)
7406. Marconi's Wireless Telegraph Co., Ltd.—Voltage regulating circuit arrangements. 24th October, 1958. (850617.)
7590. General Electric Co.—Hypersonic flow generators. 10th March, 1958. (849535.)
7640. Thompson, S.—Electrical water heaters. 10th March, 1959. (850744.)
10162. Electric & Musical Industries, Ltd.—Beam deflecting circuits for cathode-ray tubes. 19th March, 1959. (849946.)
10458. British Thomson-Houston Co., Ltd.—Control circuits for electric discharge lamps. 26th March, 1959. (849947.)
11905. Standard Telephones & Cables, Ltd.—Electric pulse code modulation systems of communication. 10th April, 1959. (849891.)
12377. Siemens-Schuckertwerke A.G.—Method of connecting an electrical conductor to an electrode of a semiconductor element. 18th April, 1958. (850119.)
13557. Telephone Manufacturing Co., Ltd.—Electrical capacitors. 27th April, 1959. (849510.)
14641. Goodrich Co., B. F.—Fast response temperature responsive electric switch. 7th May, 1958. (849851.)
16365. Bendix Aviation Corporation.—Electrical apparatus for producing impulses. 21st May, 1958. (849854.)
17710. Western Electric Co., Inc.—Travelling wave amplifiers. 3rd June, 1958. (850036.)
20315. Standard Telephones & Cables, Ltd.—Phase splitting arrangements for alternating currents. 25th June, 1958. (849893.)
20969. Ferranti, Ltd.—Cathode-ray tubes. 25th June, 1959. (849600.)
21251. English Electric Valve Co., Ltd.—Semiconductor rectifier assemblies. 24th April, 1959. (849860.)
21503. Brush Electrical Engineering Co., Ltd.—Moisture-proof protection for windings of electrical machines disposed in slots. 20th May, 1959. (850041.)
22058. British Telecommunication Research, Ltd.—Resistive circuit elements. 14th April, 1959. (849385.)
23741. General Electric Co., Ltd.—Excitation and automatic voltage regulation of alternators. 23rd June, 1959. (Addition to 831698.) (849605.)
27697. Sylvania Electric Products, Inc.—Electroluminescent device. 28th August, 1958. (849387.)
28163 and 28905. Western Electric Co., Inc.—Electrical comparator network. 2nd and 9th September, 1958. (849862 and 850503.)
32205. Union Carbide Corporation.—Electric batteries. 9th October, 1958. (849986.)
37593. Gaylord Products, Inc.—Speed responsive electric switch. 21st November, 1958. (850719.)
37971. Westinghouse Electric Corporation.—Electric circuit interruptors. 2nd December, 1958. (849869.)
40363. Hubbell, Inc., H.—Electrical plug and socket connector device. 15th December, 1958. (850069.)
40896. Siemens & Halske A.G.—Semiconductor production. 18th December, 1958. (Addition to 809250.) (849718.)
41902. Bendix Aviation Corporation.—Electrical condenser. 29th December, 1958. (849802.)



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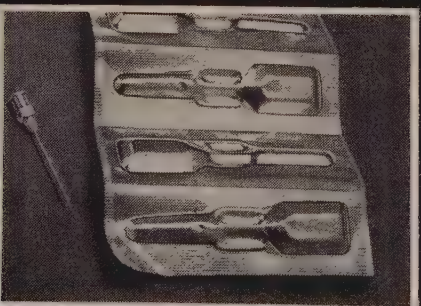
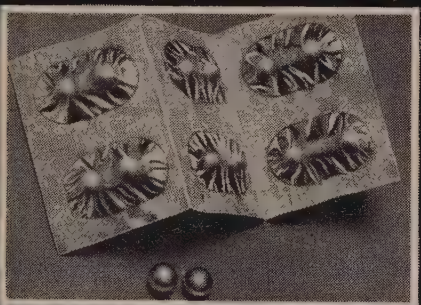
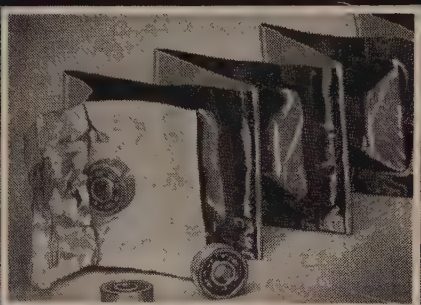
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West Germany's Electrical Industry

Continued Expansion in Production and Trade

THE output of West Germany's electrical manufacturing industry in 1959, at £1,392 million, was 11 per cent higher than in 1958, when an increase of 12 per cent was recorded. Exports rose by 15 per cent to £315 million and there was a slight improvement in the ratio of exports to production. Imports increased by 28 per cent to £51.2 million. (For comparison British electrical and allied exports last year were valued at £285.2 million and imports at £40.2 million.)

There was no significant change in the overall pattern of West Germany's electrical trade, and no sign of a diversion of exports to the Common Market countries. This group continued to account for about 23 per cent of West Germany's electrical exports while the Outer Seven countries' share

remained at around a third. Sweden (£29 million) was again the largest individual market, closely followed by Holland (£28 million). Exports to the United Kingdom, mostly of domestic appliances and electronic equipment, increased by 136 per cent and imports from this country, again mostly domestic appliances and electronic equipment, nearly doubled. Despite this rise in reciprocal trade, West Germany's exports to Britain (£14 million) were twice the value of the goods she imported from us.

Outside Europe, substantial increases were recorded in exports to the main Commonwealth markets, the United States, and the Middle East. The largest suppliers to West Germany of electrical goods were Holland and the United States.

TABLE 1.—BASIC STATISTICS OF WEST GERMANY'S ELECTRICAL INDUSTRY

	1959	1958
Number of electrical manufacturers ...	2,085	2,018
Number of employees ...	677,330	637,720
Total production (£ million) ...	1,392	1,252
Total exports (£ million) ...	315	273
Total imports (£ million) ...	51.2	40.1
Ratio exports/production (%) ...	22.6	21.7
Ratio imports/production (%) ...	3.65	3.2
Coal consumption (000t) ...	373	426
Fuel oil consumption (000t) ...	103	80
Gas consumption (mill m ³) ...	113	110
Electricity consumption (mill kWh) ...	1,552	1,443

TABLE 2.—PRODUCTION OF WEST GERMANY'S ELECTRICAL INDUSTRY

Class	Value (£ million)	
	1959	1958
Motors and generators (excl. welding generators) ...	92.3	84.1
Transformers ...	36.6	38.5
Rectifiers ...	7.6	6.6
Accumulators and batteries ...	17.5	15.0
Capacitors ...	5.1	3.7
Switchgear and switchboards above 1 kV ...	15.2	14.3
Switchgear and switchboards up to 1 kV ...	54.3	50.5
Installation material up to 1 kV ...	33.4	30.1
Insulated wire and flex ...	51.5	48.0
Cables ...	43.4	42.2
Cable and power line accessories ...	8.8	8.4
Power tools, up to 2 kW ...	7.6	6.2
Welding equipment ...	8.4	7.1
Industrial furnaces ...	9.3	8.5
Heating appliances ...	62.8	45.5
Motor driven domestic appliances ...	82.6	76.1
Refrigerators and deep freezers up to 250 litres ...	68.1	57.5
Filament lamps ...	11.3	11.2
Fluorescent lamps ...	5.4	5.3
Wire communication equipment ...	42.3	39.1
Radio communication equipment ...	12.1	6.9
Signal and safety appliances ...	7.8	7.7
Radio and TV equipment ...	151.6	138.2
Electro-acoustical equipment ...	41.9	42.0
Electronic tubes and transistors ...	31.4	25.2

TABLE 2 (continued)

Class	Value (£ million)	
	1959	1958
Components for communication equipment ...	39.5	32.7
Measuring instruments ...	23.2	20.1
Household meters ...	7.7	7.2
Control and regulating apparatus ...	20.6	16.8
Electro-medical apparatus ...	16.2	12.7
Industrial traction equipment ...	1.3	1.4
Electrical traction equipment (tractors and cars) ...	58.2	55.1

TABLE 3.—PRINCIPAL DESTINATIONS OF WEST GERMANY'S ELECTRICAL EXPORTS

Country	Value (£000)	
	1959	1958
Argentina ...	2,703	2,582
Australia ...	3,152	2,878
Austria ...	15,006	14,314
Congo ...	902	866
Belgium/Luxembourg ...	15,592	16,129
Brazil ...	3,802	4,322
Canada ...	4,126	2,626
Chile ...	2,202	1,936
Denmark ...	7,201	5,242
Egypt ...	5,821	2,877
Eire ...	891	760
Finland ...	7,603	5,188
France ...	8,921	6,448
Greece ...	4,333	4,473
Holland ...	27,983	23,214
India ...	13,722	12,236
Indonesia ...	2,322	2,331
Iran ...	7,352	4,553
Iraq ...	1,356	1,033
Israel ...	2,288	2,455
Italy ...	18,266	15,917
Lebanon ...	1,511	832
Malaya and Singapore ...	1,188	2,745
Mexico ...	2,236	2,226
Morocco ...	766	1,036
Norway ...	6,759	7,145
Pakistan ...	2,951	2,252
Peru ...	1,344	1,292
Poland ...	2,811	1,810
Portugal ...	3,589	3,655
Saar ...	5,811	5,722
Saudi Arabia ...	965	1,292
South Africa ...	6,751	5,856
Spain ...	3,921	3,293
Sweden ...	29,265	26,516
Switzerland ...	18,567	15,578
Turkey ...	3,922	2,983
United Kingdom ...	13,622	5,780
United States ...	12,893	10,446
Venezuela ...	6,526	4,916
Yugoslavia ...	4,554	3,552

TABLE 4.—PRINCIPAL SOURCES OF WEST GERMANY'S ELECTRICAL IMPORTS

Country	Value (£000)	
	1959	1958
Austria ...	1,577	1,499
Belgium/Luxembourg ...	1,126	1,825
Denmark ...	1,229	997
France ...	4,826	4,551
Holland ...	12,447	10,810
Italy ...	2,172	1,276
Saar ...	814	794
Sweden ...	1,091	924
Switzerland ...	5,483	4,718
United Kingdom ...	7,026	3,604
United States ...	12,367	7,893

TABLE 5.—WEST GERMANY'S ELECTRICAL EXPORTS IN 1959 (VALUES IN £000)

Turbo generators ...	3,684
Italy ...	229
Holland ...	551
Poland ...	54
Cuba ...	109
India ...	899
Israel ...	160
Water wheels and turbines ...	1,966
United Kingdom ...	102
Norway ...	432
Spain ...	20
Brazil ...	195
Japan ...	181
Steam engines and turbines without boilers ...	8,755
Austria ...	302
Holland ...	883
Poland ...	665
India ...	1,294
D.C. motors and generators ...	2,622
United Kingdom ...	30
Belgium ...	150
France ...	25
Italy ...	131
Holland ...	385
Sweden ...	112
South Africa ...	302
India ...	35
A.C. motors and generators ...	1,336
United Kingdom ...	169
Saar ...	194
Belgium/Luxembourg ...	742
Denmark ...	616
Finland ...	771
France ...	291
Greece ...	206
Italy ...	1,092
Yugoslavia ...	213
Holland ...	1,431
Norway ...	958
Austria ...	555
Sweden ...	1,276
Switzerland ...	990
Turkey ...	372
Egypt ...	70
South Africa ...	141
United States ...	229
Mexico ...	221
Argentina ...	48
Brazil ...	206
Venezuela ...	386
India ...	450
Pakistan ...	154
Iran ...	535
Complete generator sets ...	550
Belgium ...	108
Finland ...	253
Italy ...	351
Yugoslavia ...	267
Holland ...	264
Poland ...	372
Spain ...	134
Argentina ...	403
Brazil ...	65
Venezuela ...	186
India ...	21
Iran ...	107
Rotary converters and other motors and generators ...	1,362
United Kingdom ...	72
Italy ...	175
Switzerland ...	79

(Continued on page 804)

WEST GERMANY'S ELECTRICAL INDUSTRY
TABLE 5 (continued)

Transformers and chokes ...	7,110	Telex—telegraph and picture-by-wire equipment ...	4,811	Filament lamps ...	2,434
Saar ...	205	Sweden ...	581	Belgium ...	144
Holland ...	653	Switzerland ...	593	Sweden ...	295
Egypt ...	677	Canada ...	588	Switzerland ...	144
South Africa ...	178	Australia ...	144	Discharge lamps ...	1,233
India ...	522			Italy ...	166
Israel ...	478	Microphones, loudspeakers and amplifiers ...	1,752	Sweden ...	102
Rectifiers ...	3,720	United States ...	209	Austria ...	96
United Kingdom ...	171	Radio receivers, including record players ...	24,889	Electronic valves and photoelectric cells ...	7,207
France ...	462	Belgium ...	885	United Kingdom ...	422
Italy ...	392	Holland ...	609	Denmark ...	788
Norway ...	109	Sweden ...	1,619	Italy ...	1,230
Switzerland ...	252	Switzerland ...	1,738	Holland ...	1,074
Parts of the above, machinery and apparatus ...	5,513	Canada ...	2,277	Sweden ...	714
Denmark ...	602	United States ...	1,532	United States ...	491
France ...	372	Venezuela ...	4,003	Electric machinery and apparatus n.e.s. ...	1,088
Italy ...	426	TV receivers ...	16,884	Insulated cables ...	12,609
Holland ...	722	Belgium ...	1,223	Saar ...	314
Switzerland ...	752	Italy ...	2,223	Greece ...	583
Primary elements and batteries ...	893	Holland ...	2,219	Holland ...	733
Sweden ...	70	Sweden ...	6,750	Sweden ...	444
Accumulators ...	2,981	Switzerland ...	1,063	Egypt ...	555
Iran ...	407	Wireless transmitting and receiving equipment, TV transmitters, components and accessories ...	11,728	United States ...	282
Portable power tools ...	4,110	United Kingdom ...	203	India ...	926
Belgium/Luxembourg ...	254	Holland ...	1,403	Pakistan ...	233
Denmark ...	204	Sweden ...	2,116	Insulated wire and flex ...	5,774
Italy ...	408	Switzerland ...	611	France ...	445
Holland ...	336	United States ...	482	Holland ...	702
Austria ...	452	Condensers and capacitors ...	3,033	Sweden ...	488
Sweden ...	251	Belgium ...	53	Switzerland ...	228
Switzerland ...	454	Italy ...	355	Venezuela ...	318
Household floor polishers and vacuum cleaners ...	3,221	Holland ...	569	Electrodes for furnaces or for electrolytic processes ...	2,755
United Kingdom ...	562	Sweden ...	302	Finland ...	224
Belgium ...	254	Switzerland ...	202	France ...	129
Italy ...	252	H.v. and l.v. switchgear, and distribution equipment ...	14,011	Italy ...	411
Yugoslavia ...	148	Italy ...	1,081	Norway ...	322
Holland ...	410	Holland ...	1,126	Switzerland ...	357
Norway ...	96	South Africa ...	922	Switzerland ...	812
Austria ...	428	India ...	732	Insulators ...	156
Sweden ...	115	Installation material under 1 kV ...	8,116	Switzerland ...	1,183
Switzerland ...	181	Holland ...	1,832	Insulating materials ...	325
South Africa ...	188	Sweden ...	1,356	Holland ...	162
Washing machines ...	8,551			Switzerland ...	973
United Kingdom ...	1,644			Electric signalling and safety apparatus ...	145
Belgium ...	485			Saar ...	208
Italy ...	328			South Africa ...	779
Holland ...	1,492			Locomotives, electric ...	33
Austria ...	1,648			Belgium ...	148
Sweden ...	430			Spain ...	307
Switzerland ...	1,489			Brazil ...	307
Domestic fans ...	482				
Other domestic appliances with incorporated electric motors ...	1,833				
Austria ...	332				
Shavers and hair clippers ...	2,223				
Sweden ...	222				
Switzerland ...	206				
United States ...	795				
Ignition and starting equipment for explosion motors ...	8,202				
Austria ...	644				
Sweden ...	1,950				
United States ...	282				
Electrical equipment for cars and bicycles ...	4,983				
Holland ...	442				
Austria ...	288				
Sweden ...	1,093				
Australia ...	318				
Torches and flashlights ...	628				
United States ...	561				
Industrial and laboratory ovens and furnaces ...	3,981				
United Kingdom ...	69				
France ...	362				
Austria ...	98				
Switzerland ...	276				
Russia ...	139				
Fat irons ...	1,277				
Iceland ...	113				
Holland ...	143				
Austria ...	223				
Sweden ...	46				
Cookers and boiling plates ...	1,409				
Greece ...	208				
Yugoslavia ...	106				
Austria ...	145				
Sweden ...	178				
Switzerland ...	168				
Other domestic appliances, including hairdryers and heating elements ...	4,188				
United Kingdom ...	362				
Belgium ...	431				
Italy ...	234				
Holland ...	422				
Austria ...	284				
Sweden ...	281				
Switzerland ...	343				
Telephone apparatus and equipment ...	9,801				
Saar ...	285				
Finland ...	602				
Greece ...	671				
Italy ...	585				
Holland ...	261				
Sweden ...	395				
United States ...	398				
Guatemala ...	69				
Argentina ...	432				
Iran ...	1,098				

LIVERPOOL LIGHTING INSPECTION

A greater use of the services of the City Lighting Department by the Corporation was urged by Alderman Hugh Carr, chairman of the Liverpool Lighting Committee, at the Committee's annual inspection of the city lighting on 17th October. The afternoon programme included a visit to the Mersey Tunnel and, during the evening, an inspection of street lighting. Of particular interest was the experimental installation of 200 W "Phosware" non-cut-off lanterns, mounted 35ft high, on a one-mile stretch of Stanley Road. Speaking at a dinner following the inspection, Alderman Carr said that the major task of re-lighting the Mersey Tunnel had been completed at a cost of approximately £12,000, and work was going ahead on the renewal of cables at an overall cost of about £250,000, and additional ventilation also costing about £250,000. The latest figures of the city's lighting installations were 30,943 electric and 7,586 gas lamps, compared with about 18,000 electric and 15,000 gas in 1939. Conversion from gas to electricity had been considerably accelerated over the past five years.

Alderman Carr said he had already

put to the committee some ideas for the floodlighting of various places in the city, and in particular the promotion of a sound and light spectacle at Speke Hall. Other speakers paid tribute to the work of Mr. C. C. Smith, the city lighting engineer, and his staff.

STREET LIGHTING PLANS

Bournemouth Highways and Works Committee proposes to put in hand the replacement of gas street lighting by electric lighting in part of Boscombe as soon as the second stage of the ten-year scheme has been completed. The estimated cost is £20,000.

Chesterfield Town Council is to convert further gas street lighting to electricity at a cost of £5,459.

Middlesbrough Town Council has approved in principle a further stage of its street lighting programme, estimated to cost £54,200.

Southall Borough Council is recommended to accept the tender of O. C. Summers, Ltd., amounting to £4,157 for the installation of new electric street lighting in Tentelow Lane and Windmill Lane.

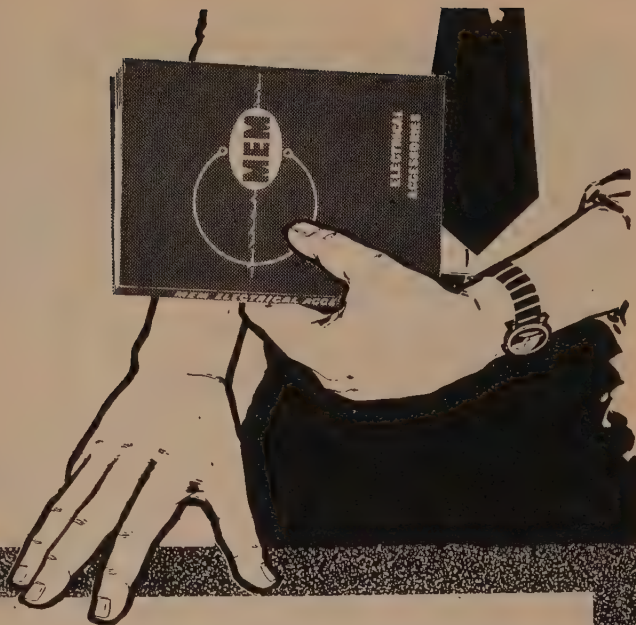
Wigston U.D.C. proposes to spend £14,000 on, the conversion to electricity of the remaining gas lamps.

Worthing Highways Committee plans to replace hand-wound street lighting time switches by electrically operated switches in those areas of the town where the supply has been converted from d.c. to a.c. It is recommended that application should be made for consent to borrow £8,000 for the purpose.

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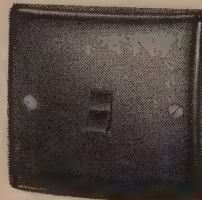
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71 TFB

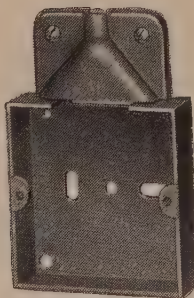
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"TAY" plaster depth boxes

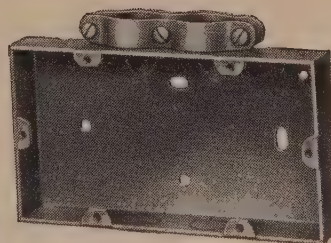
- Wood, moulded and steel.
- Steel boxes available with insulated lugs adjustable for alignment.
- A range of steel boxes available with special clamps for M.I.C.C. cables.



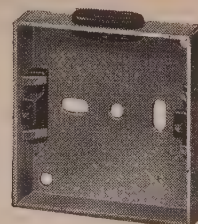
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SBM 7101



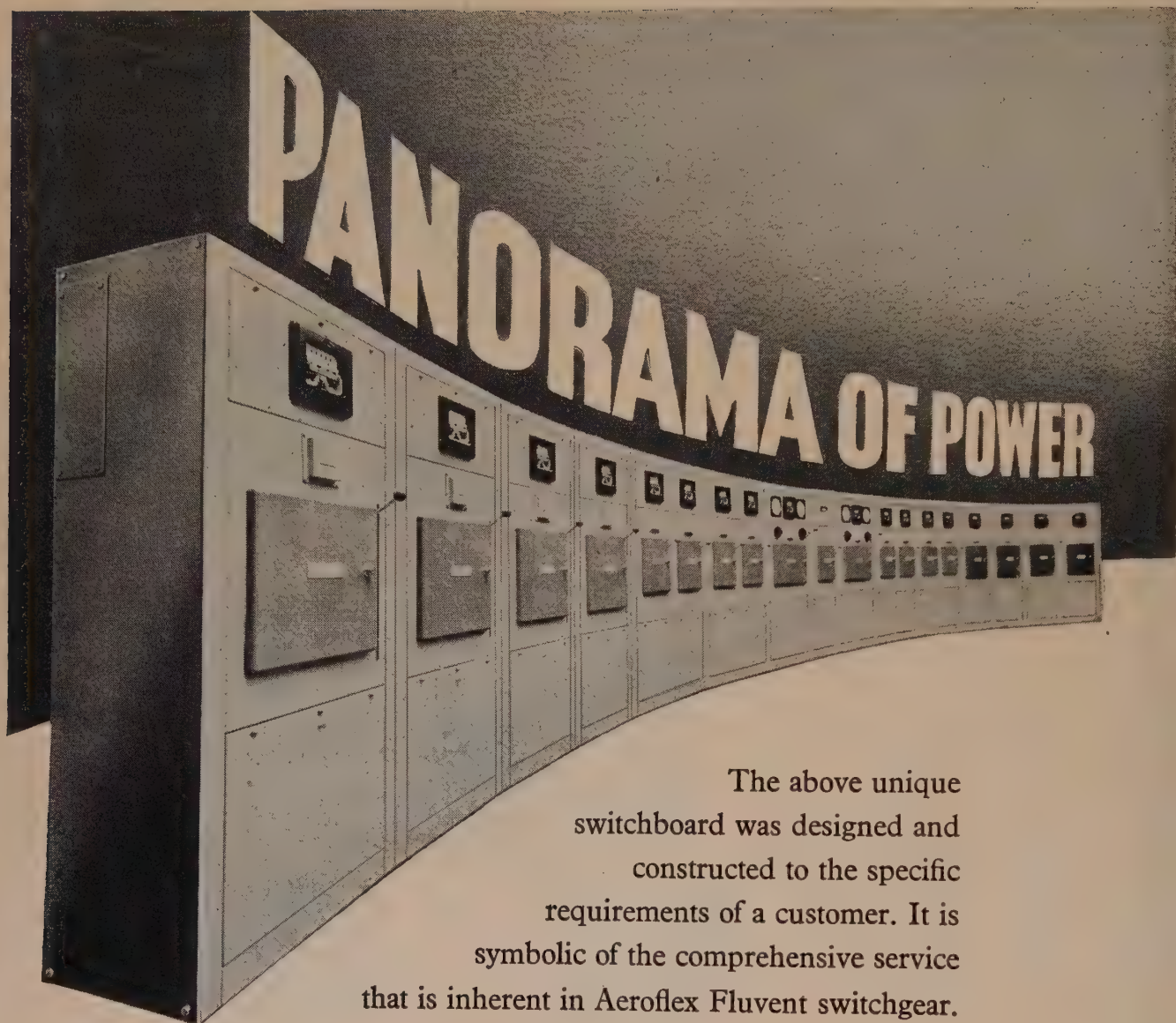
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NEXT WEEK'S EVENTS

Organisers of electrical functions are advised to make use of the "Electrical Review" clearing house, Room 221, Dorset House, Stamford Street, London, S.E.1, to ascertain that proposed dates for their functions do not clash with others already arranged.

MONDAY, 7th NOVEMBER

Birmingham.—James Watt Memorial Institute, 6.30 p.m. I.E.E. South Midland Centre. "A Survey of Street Lighting and its Future," by W. R. Stevens and H. M. Ferguson.

Bolton.—Railway Hotel, Trinity Street, 7.45 p.m. A.S.E.E. Bolton Branch. "Under-Floor Cable Ducts."

Glasgow.—39, Elmbank Crescent, 6 p.m. I.E.E. Scottish Electronics and Measurement Group. "Advances in Semiconductor Devices and Circuits," by Dr. J. Evans and T. H. Walker.

Iford.—Angel Hotel, Broadway, 8.15 p.m. A.S.E.E. Essex Branch. "Electric Floor-Warming," by G. C. Peacock and G. E. East.

Leeds.—Great Northern Hotel, 7.30 p.m. A.S.E.E. Leeds Branch. "Metal Rectifiers," by D. Magnail.

Liverpool.—Adelphi Hotel, 7 p.m. I.E.E. Mersey and North Wales Centre. Annual dinner.

London.—Geological Society, Burlington House, 5.30 p.m. Society of Engineers. "The Heat Pump in Great Britain," by Miss M. V. Griffith.

Maidstone.—Technical College, 6.30 for 7 p.m. I.E.E. Maidstone Branch. "Subscriber Trunk Dialling," by H. E. Francis.

Newcastle-upon-Tyne.—Neville Hall, Westgate Road, 6.15 p.m. I.E.E. North Eastern Centre. "Water-Turbine-Driven Induction Generators," by C. L. C. Allan.

Sheffield.—Royal Victoria Hotel, 7.30 p.m. A.S.E.E. Sheffield Branch. "Modern Lighting as Applied to all Phases of the Electrical Industry," by V. L. Turp.

TUESDAY, 8th NOVEMBER

Belfast.—David Keir Building, Queen's University, Stranmillis Road, 6.30 p.m. I.E.E. Northern Ireland Centre. "The Application of Irradiation in Industry," by M. C. Crowley-Milling.

Cardiff.—Park Hotel, Park Place, 7.30 p.m. A.S.E.E. South Wales Branch. "Fire Fighting and Prevention," by C. N. Bidgood.

Chester.—Westminster Hotel, City Road, 7.45 p.m. A.S.E.E. Chester and District Branch. "The Protection of Electrical Installations," by J. A. Robbins.

Edinburgh.—Carlton Hotel, North Bridge, 7 p.m. I.E.E. Scottish Electronics and Measurement Group. "Advances in Semiconductor Devices and Circuits," by Dr. J. Evans and T. H. Walker.

Leeds.—Leeds and County Conservative Club, South Parade, 7 p.m. I.E.E. North Midland Graduate and Student Section. "The Experimental Investigation of Space," by Dr. P. J. Bowen.

College of Technology, Calverley Street, 6.30 p.m. I.E.E. North Midland Centre. Discussion on "City and Guilds or National Certificate?" to be opened by G. P. Evans.

London.—F.B.I., Tothill Street, S.W.1. Illuminating Engineering Society. "25 Years of Stage Lighting," by F. P. Bentham.

Great George Street, S.W.1, 5.30 p.m. Institution of Civil Engineers. "Some Contributions from Nuclear Power to Engineering Practice," by Ian Davidson.

Manchester.—Engineers' Club, Albert Square, 6.15 p.m. I.E.E. North Western and Mersey and North Wales Centres. "Submersible Pumping Plant," by H. H. Anderson and W. G. Crawford.

Engineers' Club, Albert Square, 7.15 p.m. Institution of Plant Engineers, Manchester Branch. "Pressure Vessels," by C. W. Scarisbrick.

Newcastle-upon-Tyne.—Roadway House, Oxford Street, 7.30 p.m. A.S.E.E. Newcastle-upon-Tyne and District Branch. "Temperature Controls."

Portsmouth.—Ministry of Labour Offices, Lake Road, 7.30 p.m. A.S.E.E. Portsmouth and District Branch. Film night.

York.—Royal Station Hotel, 7.30 p.m. A.S.E.E. York Branch. "The Aims and Objects of the National Inspection Council," by P. Laughton.

WEDNESDAY, 9th and THURSDAY, 10th NOVEMBER

London.—1, Birdcage Walk, Westminster, S.W.1. Institution of Mechanical Engineers. Symposium. "Use of Secondary Surfaces for Heat Transfer with Clean Gases."

WEDNESDAY, 9th NOVEMBER

Birmingham.—Birmingham Exchange and Engineering Centre, Stephenson Place, 7.30 p.m. A.S.E.E. Birmingham Branch. "Modern Light Sources and their Application," by W. A. R. Stoyale.

James Watt Memorial Institute, 6.30 p.m. I.E.E. South Midland Graduate and Student Section. "High Power Rectifiers," by D. Finney.

Bristol.—Grand Hotel, Broad Street, 7.15 p.m. Institution of Plant Engineers, Western Branch. "Modern Engineering Insurance," by K. J. Roberts.

Edinburgh.—The University, Drummond Street, 7 p.m. British Institution of Radio Engineers, Scottish Section. "V.H.F. AM/FM Transistor Receivers," by H. A. Heins. (Also at 39, Elmbank Crescent, Glasgow, at 7 p.m. on 10th November.)

Glasgow.—39, Elmbank Crescent, 6 p.m. I.E.E. South West Scotland Sub-Centre. "The Digital Computer," by Dr. I. Cochran.

Lancaster.—N.W.E.B., Lancaster Road, 7.15 p.m. I.E.E. North Lancashire Sub-Centre. "Some Aspects of Telephone Plant Protection in the Lancaster Area," by L. William.

Leicester.—Midland Hotel, 7.30 p.m. Institution of Plant Engineers, Leicester Branch. "Industrial Power Generation," by A. Wheating or J. M. Berridge.

London.—10, Chesterfield Street, Mayfair, W.1, 7.15 p.m. Institution of Production Engineers, South Eastern Region. "Induction Heating," by D. G. Jones.

45, Great Peter Street, Westminster, S.W.1, 6.30 for 7 p.m. Women's Engineering Society, London Branch. "Railway Modernisation and Electrification," by E. C. Cookson.

Luton.—Luton College of Technology, Park Square, 8.15 p.m. A.S.E.E. Luton Branch. "The Aims of the Electrical Association for Women," by Miss A. S. Lockhart.

Manchester.—Café Royal, Peter Street, 6.30 for 7 p.m. I.E.S. Manchester Centre. Annual dinner.

Newcastle-upon-Tyne.—Institution of Mining and Mechanical Engineers, Neville Hall, Westgate Road, 6 p.m. British Institution of Radio Engineers, North Eastern Section. "Distribution of Sound and Television by Wire," by A. W. Mews.

Rutherford College of Technology, Northumberland Road, 6.15 p.m. I.E.E. North Western Electronics and Communication Group. "Applications of Microwaves," by Professor A. L. Cullen.

Newport (Mon.).—King's Head Hotel, 6.30 p.m. Newport and District Electric Club. "The Design and Jointing of Low Voltage Plastic Insulated Mains Cable," by D. H. Booth.

Northampton.—Room B16, College of Technology, 7.15 p.m. Northampton and District Electrical Association. "Radio-isotopes in Industry, Medicine and Agriculture," by R. M. Longstaff.

Nottingham.—County Hotel, Theatre Square, 7 p.m. Institution of Plant Engineers, East Midlands Branch. "Communicating with Others," by R. Gregory.

Rugby.—Masonic Hall, 7.30 p.m. I.E.E. Rugby Sub-Centre. Annual dinner.

Sheffield.—The University, I.E.E. Sheffield Sub-Centre Graduate and Student

Section. "The Experimental Investigation of Space," by Dr. P. J. Bowers.

Wolverhampton.—College of Technology, Wulfruna Street, 7.15 p.m. British Institution of Radio Engineers, West Midland Section. "Modern Computer Techniques," by K. C. Johnson.

THURSDAY, 10th NOVEMBER

Bradford.—Midland Hotel, 7.30 p.m. A.S.E.E. Bradford and District Branch. "Power Transformers," by J. Bennett.

London.—Connaught Rooms, W.C.2, 6.45 for 7.15 p.m. Public Transport Association. Annual dinner.

Prince of Wales Hotel, S.W.19, 8.30 p.m. A.S.E.E. South West London Branch. "Under-floor Heating," by L. Bishop, and "Maintenance of an Electro-plating Plant," by B. Mitchison.

Newcastle-upon-Tyne.—Roadway House, Oxford Street, 7 p.m. Institution of Plant Engineers, North East Branch. "The Planning and Operation of Industrial Estates," by G. Perry.

Swansea.—South Wales Electricity Board, The Kingsway, 6 p.m. I.E.E. West Wales (Swansea) Sub-Centre. "The Shielding of Overhead Lines against Lightning," by Dr. J. H. Gridley.

FRIDAY, 11th NOVEMBER

London.—Caxton Hall, Westminster, S.W.1, 6.30 p.m. E.P.E.A. Meter Engineers' Technical Group. "Prepayment Methods," by H. S. Petch.

14, Rochester Row, Westminster, S.W.1. Junior Institution of Engineers. "Railway Signalling Problems in 50 c/s Traction Area," by Hubert J. N. Riddle.

Nottingham.—Welbeck Hotel, 6.30 for 7 p.m. Institution of Plant Engineers, East Midlands Branch. Dinner and dance.

Saltburn-by-the-Sea.—Zetland Hotel, 7 for 7.30 p.m. I.E.E. Tees-Side Sub-Centre. Annual dinner and reunion.

Southampton.—Royal Hotel, 7.30 p.m. A.S.E.E. Southampton and Portsmouth and Bournemouth District Branch. Annual dinner.

TRADE MARKS

APPLICATIONS have been made for the registration of the following trade marks. Objections may be entered up to 26th November, 1960.

Design. No. 802,838. Class 7. Washing, drying, ironing and dish-washing machines. No. 802,839. Class 11. Domestic electric appliances and parts.—Kelvinator, Ltd., New Chester Road, Bromborough, Cheshire.

Auto-Chief. B800,221. Class 9. Control apparatus for automatically maintaining predetermined temperatures in cooking appliances.—British Thermostat Co., Ltd., Teddington Works, Windmill Road, Sunbury-on-Thames, Middlesex.

Electrochord. B802,717. Class 9. Radio receiving sets, apparatus for recording and reproducing sound by means of magnetic tape, etc.—George Whitaker & Son, Ltd., Lorrmore Buildings, Olney Road, Walworth, London, S.E.17.

Bluecon. No. 805,793. Class 9. Electrical capacitors.—Dubilier Condenser Co. (1925), Ltd., Ducon Works, Victoria Road, North Acton, London, W.3.

Lepad. No. 806,241. Class 9. Electrical connections for coils.—Daisy May Wake (trading as Lepads), 13, Dalton Avenue, St. Helen's Auckland, Bishop Auckland, Co. Durham.

Splendor. No. 805,532. Class 10. Electrically heated blankets.—Splendor England, Ltd., 7c, Lower Belgrave Street, London, S.W.1.

CONTRACT INFORMATION

Accepted Tenders and Prospective Electrical Work

CONTRACTS OPEN

Where "Contracts Open" are advertised in our "Official Notices" section the date of the issue is given in parentheses

Aberdeen.—City Lighting Department. 28th November. Electric lamps. (See this issue.)

Australia.—State Electricity Commission of Queensland. 14th December. Transformers. (E.S.B. 28150/60.)*

N.S.W. Electricity Commission. 21st November. Batteries and charging equipment. (E.S.B. 28148/60.)* 29th November. 330 kV isolating and earthing switches, etc. (E.S.B. 28109/60.)*

Victorian Railways. 23rd November. Supervisory switchgear. (E.S.B. 28173/60.)*

Blackpool.—Fylde Water Board. 18th November. Control switchboard for 40 h.p. compressor motor and station auxiliaries, Hodder Works, Slaidburn. (See this issue.)

Braintree and Bocking.—U.D.C. 2nd December. Group "B" street lighting installation. (See this issue.)

Cardiff.—Welsh College of Advanced Technology. 28th November. Analogue computer. (See this issue.)

Formosa.—Central Trust of China. 21st November. Telephones and heavy electrical equipment. (E.S.B. 27814/60/I.C.A.)*

Hampshire.—County Council. 28th November. Science equipment, Eastleigh Technical College. (See this issue.)

India.—Delhi Municipality. 14th November. H.v. and L.v. cables. (E.S.B. 27666/60.)*

Director General of Supplies and Disposals, New Delhi. 11th January, 1961. Crushing plant and electrical equipment. (E.S.B. 27696/60.)*

General Manager and Chief Engineer, Railway Electrification, Calcutta. 15th February, 1961. 25 kV traction overhead equipment. (E.S.B. 28103/60.)*

Department of Atomic Energy, Bombay. 31st May, 1961. Tarapur atomic power project. (E.S.B. 27822/60.)*

Iran.—State Railways, Teheran. 26th November. H.v. cable. (E.S.B. 27802/60.)*

Manchester.—Corporation. 5th December. Outside lighting, Davyhulme sewage works. (See this issue.)

Middlesex.—County Council. 24th November. Electrical installation work at Deep-hams sewage works. (See this issue.)

Oxford.—Corporation Water Undertaking. 1st February, 1961. Electrically driven pumping plant. (See this issue.)

Pakistan.—Director of Supply, East Pakistan. 23rd November. Lighting fixtures and refrigerators. (E.S.B. 28139/60.)*

Selby.—U.D.C. 21st November. Group "A" street lighting installation. (See this issue.)

South Africa.—Stores Department, South African Railways. 2nd December. Light-house equipment. (E.S.B. 27635/60.)*

Sudan.—Stores Department, Sudan Railways. 7th December. D.c. generator. (E.S.B. 27676/60.)*

Thailand.—State Railways. 28th November. Electrically driven overhead trolley conveyors. (E.S.B. 28104/60.)*

Royal Irrigation Department. 18th January, 1961. 230 kV auto-transformers and 13.2 kV shunt reactors. (E.S.B. 28198/60.)*

United States.—U.S. Army Mobile Corps of Engineers, Alabama. 17th November. Control switchboards, motor generators, etc. (E.S.B. 28197/60.)*

ORDERS PLACED

Brighton.—Waterworks Committee. Three "Electromersible" pumps, four booster pumps, control gear and instrumentation for Patcham pumping station.—Hayward Tyler & Co. The value of the contract is about £24,000.

Durham.—County Education Committee. Electrical work at schools:—Lambton County School (£1,262).—R. Robson. Eggescliffe New Modern School (£6,384) and Fairfield Infants' School (£1,866).—Cox-Walkers. Neville's Cross Training College (£9,316) and Easington Technical College (£17,648).—North of England Eng. & Electrical Co. Peterlee Dene House Modern School (£7,914).—T. Mitchelson (Electrical).

London.—L.C.C. Renewal and improvement of electrical installation in Harwood County Primary School, Fulham (£2,588).—L. Power & Son.

Middlesbrough.—Corporation. Telephone equipment for new police headquarters (£5,243).—Automatic Telephone & Electric.

WORK IN PROSPECT

Particulars of new works and building schemes for the use of electrical installation contractors and traders. Publication in this section is no guarantee that electrical work is definitely included. Alleged inaccuracies should be reported to the Editors

Bentley (Yorks.).—Secondary and primary schools; county architect, Wakefield.

Bicester.—Dwellings (120); R. Miller Developments, Ltd., 20, Sparrows Herne, Bushey.

Birkenhead.—Fire station, Woodchurch area; Gornall, Kelly & Partners, architects, 69, The Albany, Liverpool.

Birmingham.—Seven-storey homes, Perry Barr and Ladywood; city architect, Civic Centre, 1.

Bodiam (Sussex).—C.E. school; county architect, County Hall, Lewes.

Cardiff.—Works, Pengam; Rover Co., Ltd., Solihull.

Chatham.—Paper technology laboratories, Medway College of Technology, Horstead; county architect, County Offices, Springfield, Maidstone.

Chester-le-Street.—Shops, offices and showroom, North Burn; C. Solomon, architect, 30, St. Mary's Place, Newcastle-on-Tyne.

Dumfriesshire.—New Annan Academy (£400,000); county architect, County Offices, Dumfries.

Eastbourne.—Cold store and depot, Lottbridge Grove; Bird's Eye Foods, Ltd., Hesketh House, Portman Square, London, W.1.

Erith.—Housing estate, Appian Way, Belvedere (£243,000); borough engineer, Town Hall.

Gateshead.—Houses, Chandos redevelopment area (232), Rectory site (52), Tetholm Road (30) and Mendip Gardens (22); borough engineer.

Goring-by-Sea.—Congregational church, Barrington Road; Weston, Burnett & Thorne, architects, 44, Westwood Road, Southampton.

Greenock.—Redevelopment of town centre; Murrayfield Real Estates Co., Ltd., 7, Albyn Place, Edinburgh.

Harrogate.—Three twelve-storey blocks of flats and maisonnettes, Park Parade; James Cubitt & Partners, architects, James Street.

Herefordshire.—School, Garway; county architect, Bath Street, Hereford.

Horley.—Shops and maisonnettes, High Street; Morrison, Rose & Partners, architects, 4, Wimpole Street, London, W.1.

Hucknall.—Houses (150), Welbeck estate; surveyor, Council Offices, Watnall Road, Hucknall, Notts.

Ireland.—Factory and offices, Sligo; Liebig's Extract of Meat Co., Ltd., Thames House, London, E.C.4.

Keynsham.—Shops and offices, Civic Centre; F. J. Bryan, architect, Council Offices.

Kirk Sandall.—Primary school; county architect, Wakefield.

Lanark.—Departmental store, High Street, for F. W. Woolworth & Co., Ltd.; chief architect, Woolworth House, Marylebone Road, London, N.W.11.

London.—Rebuilding Westbourne Park Baptist Church and Hall, Bayswater; Ansell & Bailey, architects, 14, Gray's Inn Square, W.C.1.

New buildings for Convent of the Assumption, Kensington Square, Kensington; C. Lovett Gill & Partners, architects, 41, Russell Square, W.C.1.

Office block, 257/285, Upper Street, Holloway; Courtney & Fairbairn, Ltd., 377, Albany Road, S.E.5.

Dwellings (402), Rathbone Street, West Ham; borough architect.

Luton.—Additional factory premises; Hayward Tyler, Ltd., Crawley Green Road.

Middlesbrough.—Printing works, Longlands Road, for Jordison & Co.; J. G. L. Poulson, architect, 54, Albert Road.

R.C. church at Beechwood; S. Stevenson-Jones, architect, Harley Buildings, Old Hall Street, Liverpool.

Newcastle-on-Tyne.—Blocks of flats (180 dwellings) at Longbenton; city architect, 18, Cloth Market.

Northants.—Corby Beanfield Infants' School; county architect, County Hall, Northampton.

Oxford.—Eight-storey block of teaching and research laboratories, South Parks Road, for University Chest; Northcroft, Neighbour & Nicholson, quantity surveyors, Victoria House, Southampton Row, London, W.C.1.

Works extensions; W. Lucy & Co., Ltd., Eagle Ironworks.

Paignton.—Pavilion (£145,000); U.D.C. surveyor.

Selby.—Church, Steynor Wood estate; G. L. Thompson, architect, 22, Park Street.

Teignmouth.—Theatre and conference hall, Carlton Place (£45,000); surveyor, Bitton Park.

Tunbridge Wells.—Houses (126), Sherwood estate; William Pickering, borough engineer, Town Hall.

West Bromwich.—Dwellings (239), Charlemont Farm estate; borough surveyor.

West Hartlepool.—Works extensions; Expanded Metal Co., Ltd.

Willesden.—Houses, Willesden Lane (101), Donnington Road (44), Iflington Road (38) and South Kilburn (24); borough engineer, Town Hall, Dyne Road, Kilburn, N.W.6.

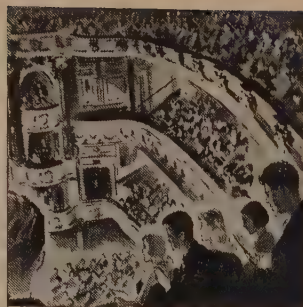
Wolverhampton.—Old people's home at the Broadway, Bushbury (£83,000); borough engineer, Town Hall.

Worcester.—Covered bath (£175,000); city engineer, 22, Bridge Street.

Workington.—Houses (200); borough engineer.

* This information is extracted from the Board of Trade Export Service Bulletin. Inquiries should be addressed to the Board of Trade, Export Services Branch, Lacon House, Theobald's Road, London, W.C.2 (Telephone: Chancery 4411, Ext. 738), quoting the reference given.

EMERGENCY LIGHTING—The new cells have been designed for uses where stand-by electrical power is required. By their very nature they are especially suited to emergency lighting in power stations, sub-stations, theatres, concert halls, hospitals, factories and public buildings of all sorts.



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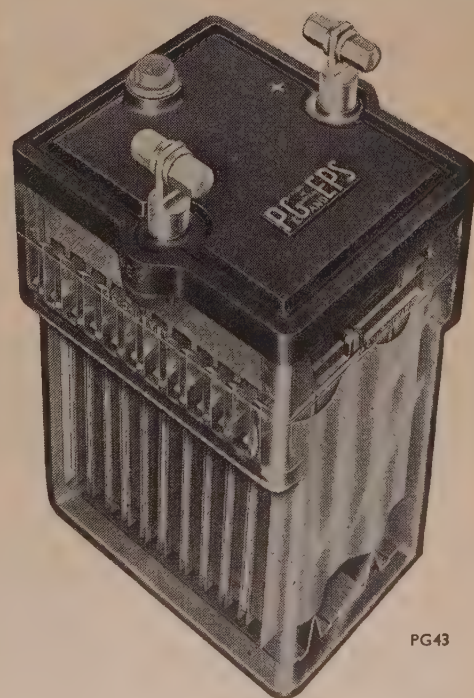
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"COOLERWAY" **£5.19.6**

COOLERWAY ROYAL **£6.19.6**

COOLERWAY DE LUXE **£10.19.6**
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"TOASTAWAY"

AUTOMATIC TOASTER

Clockwork timer. End levers turn bread over in one movement. In stainless steel with black moulded ends and base. 700 watts.

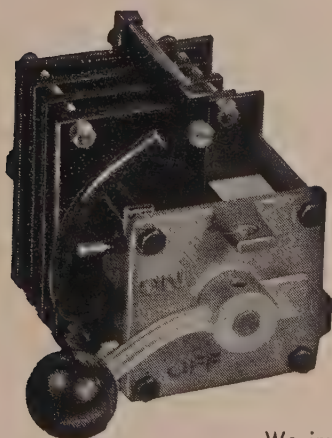
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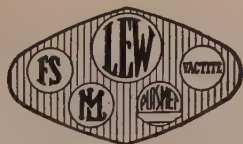
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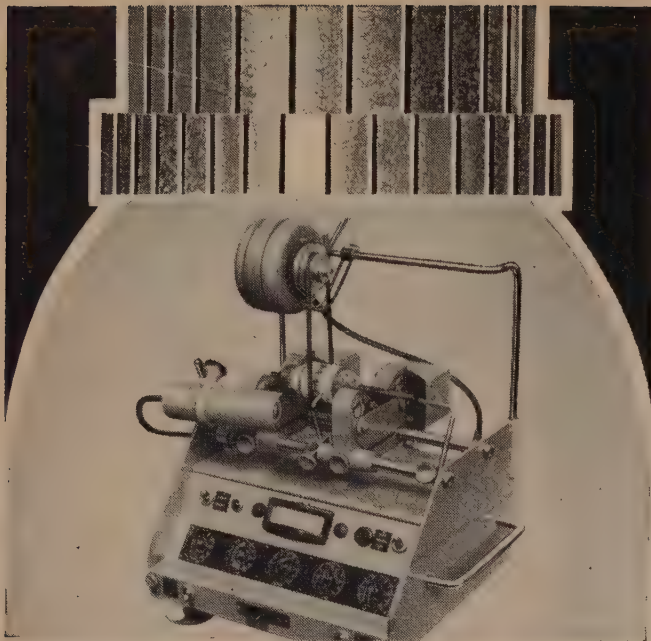
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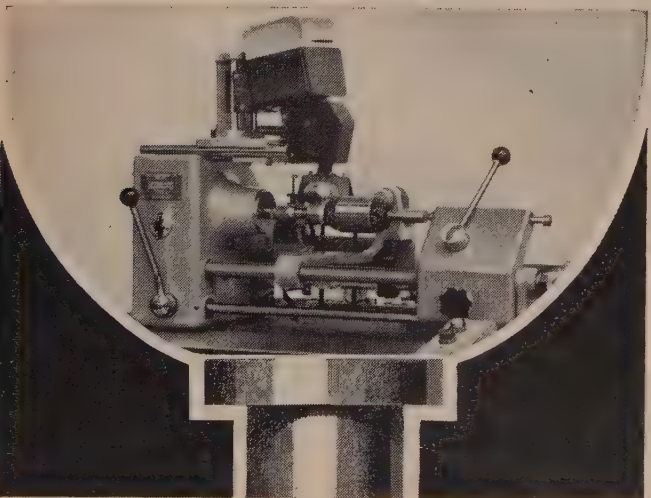


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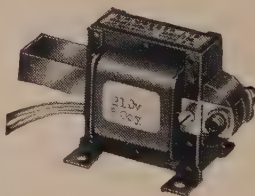
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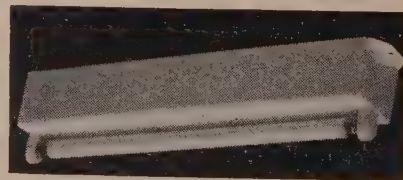
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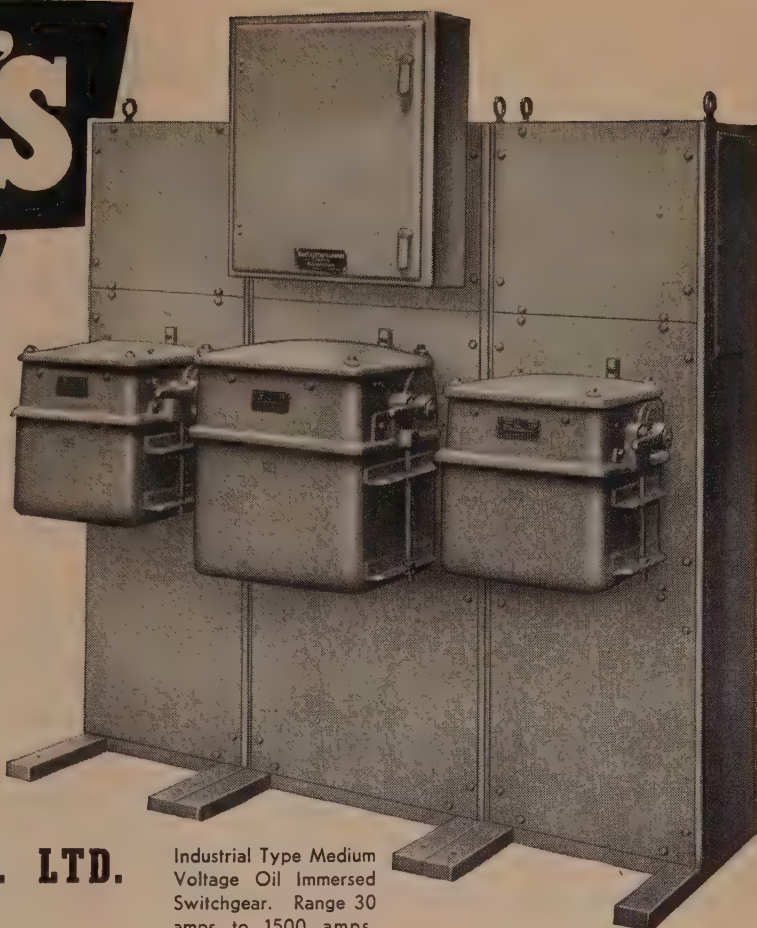


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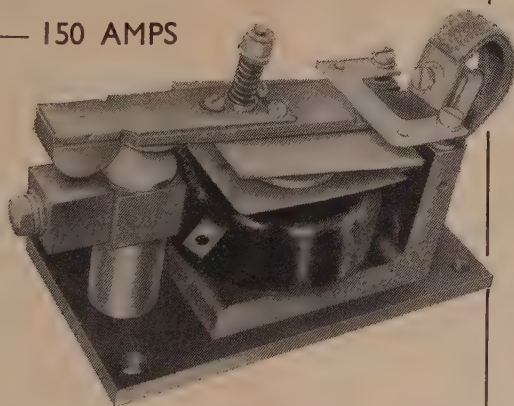
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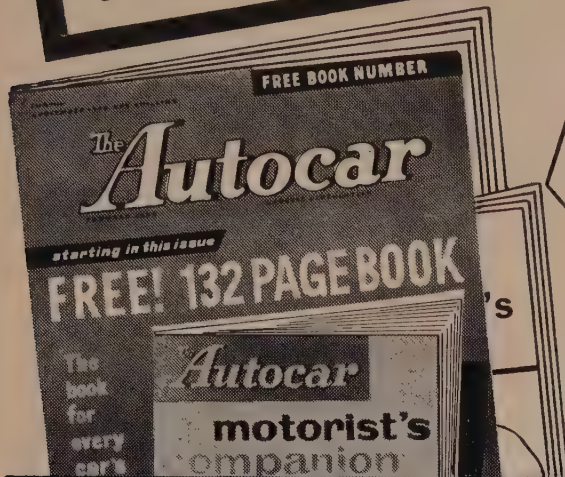
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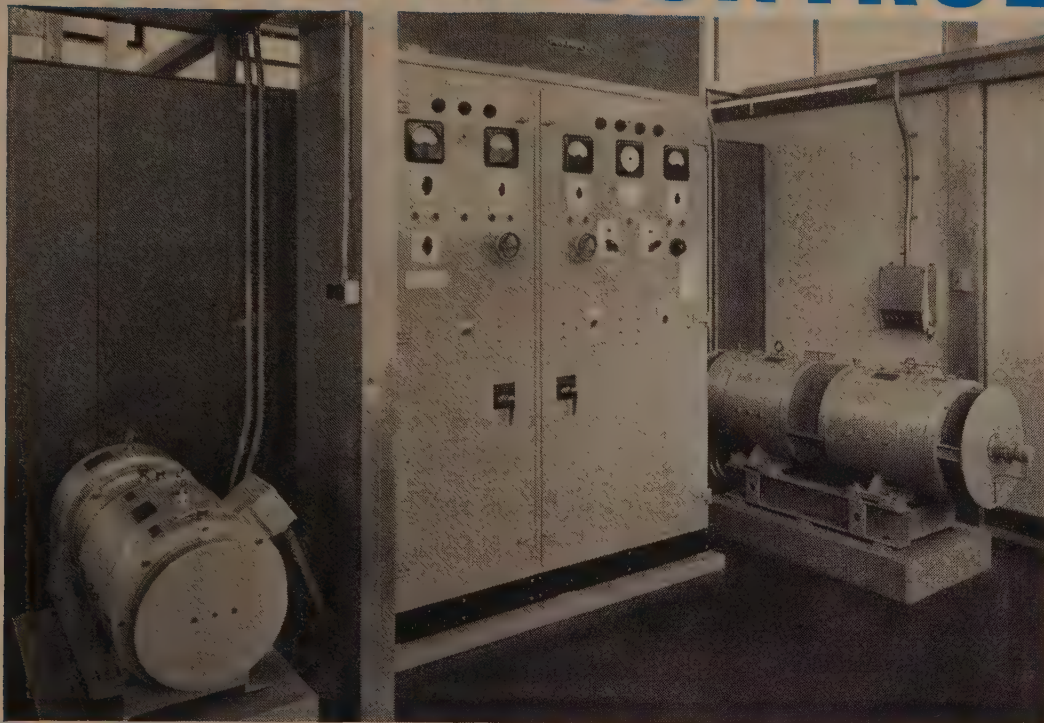
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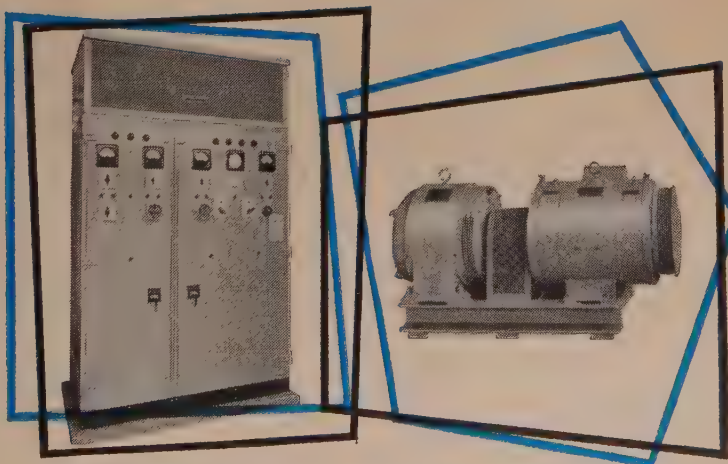


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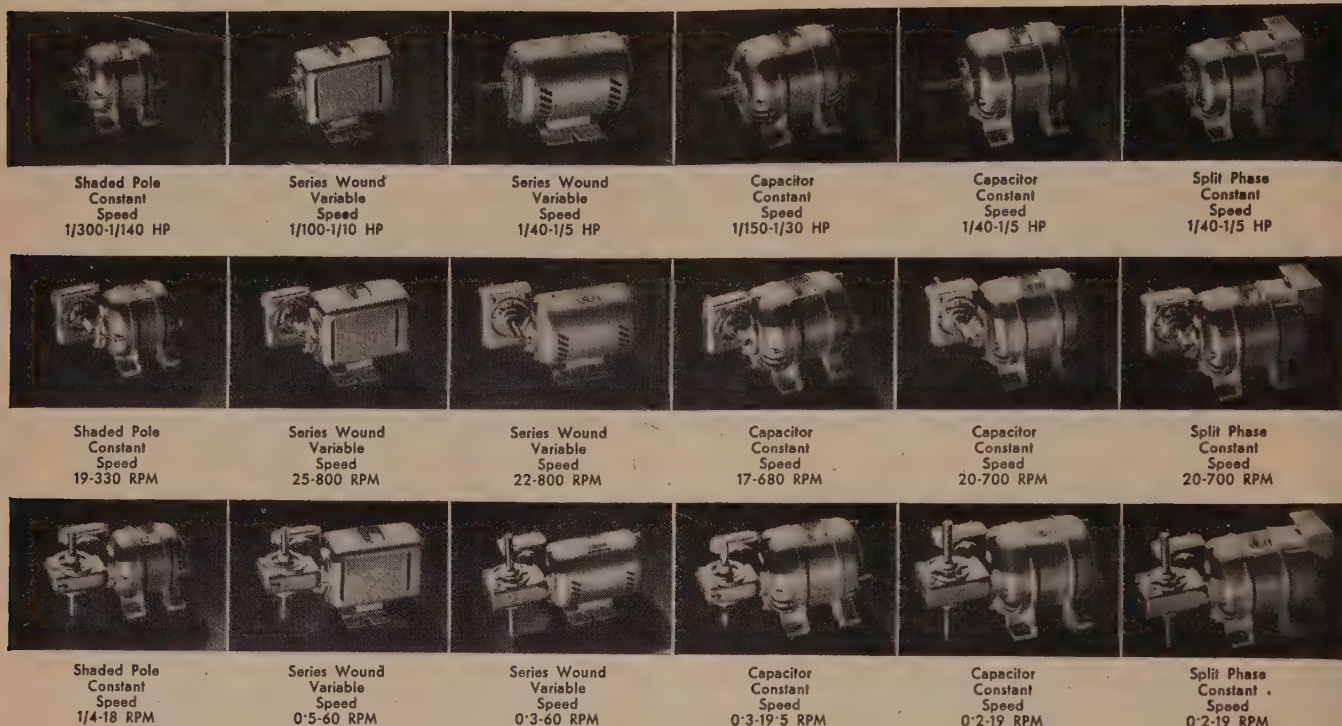


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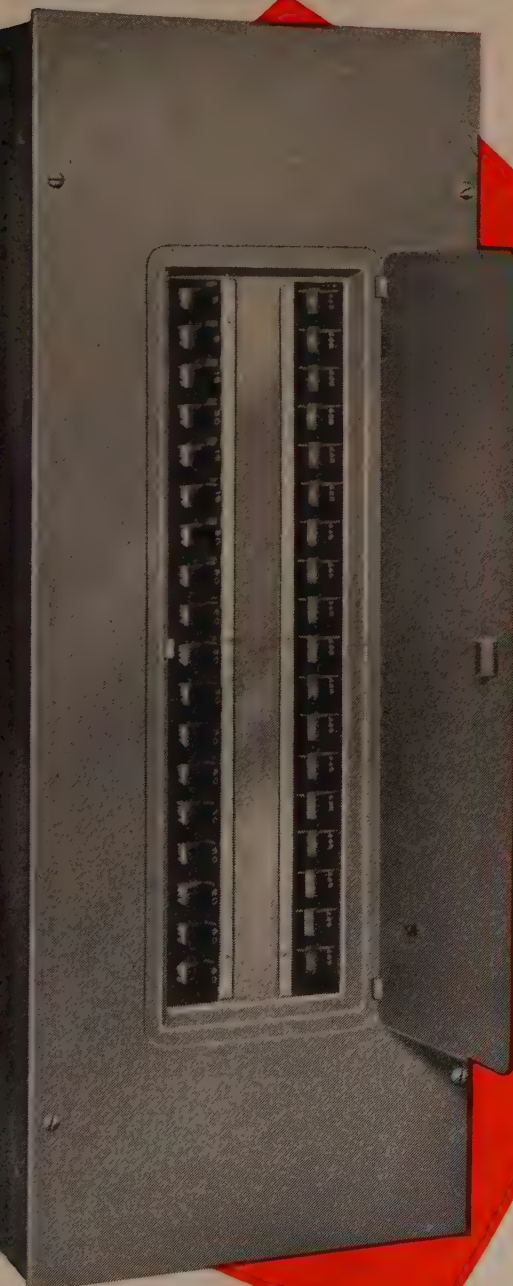
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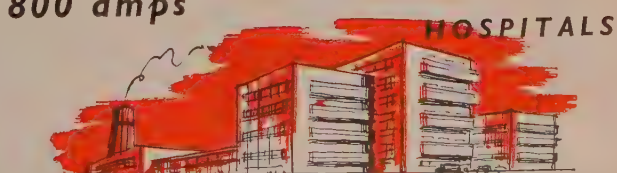
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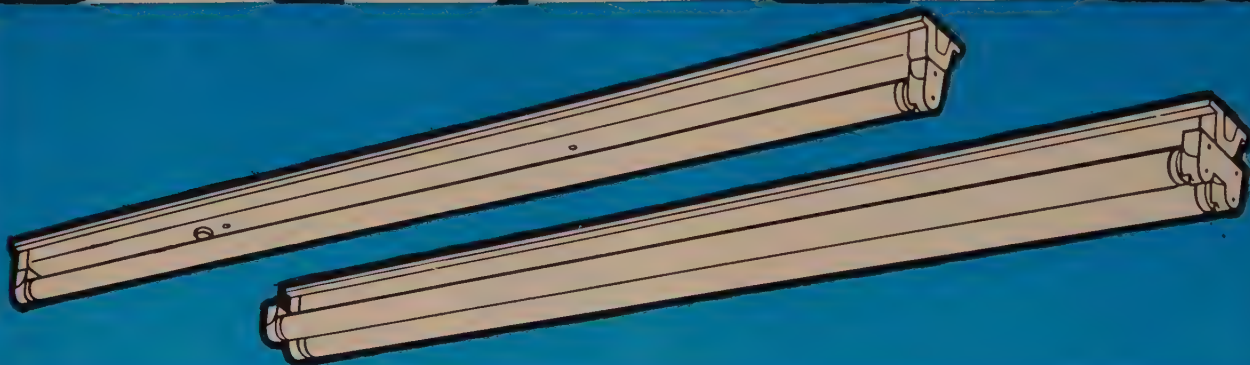
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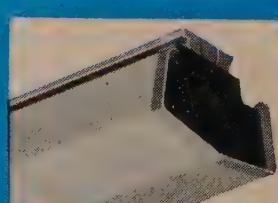
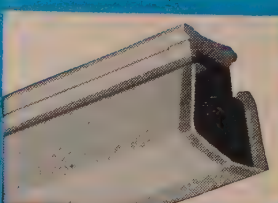
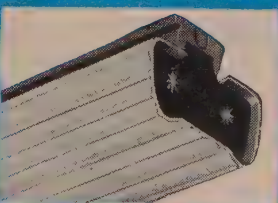
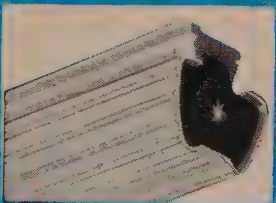
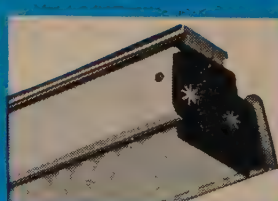
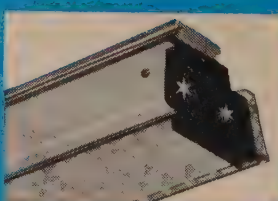
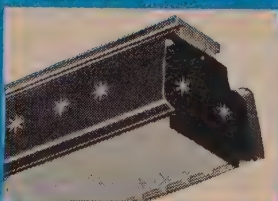
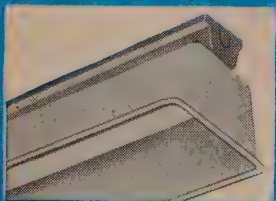
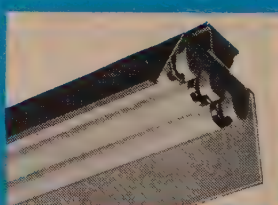
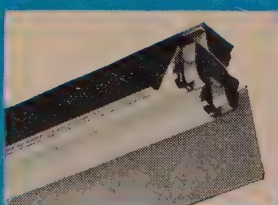
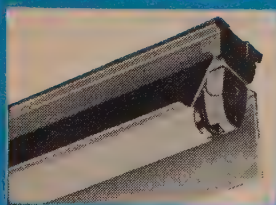
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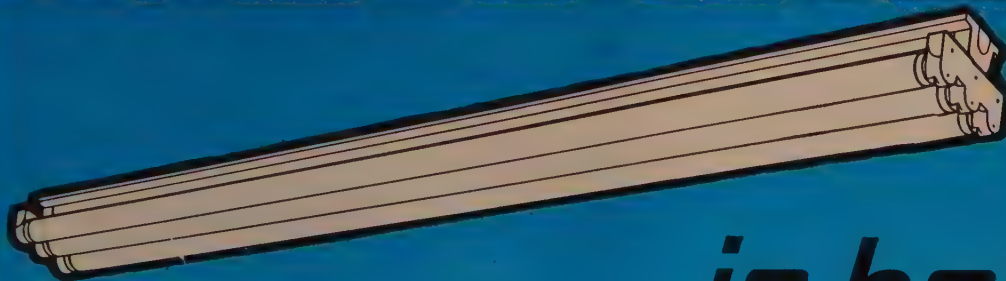
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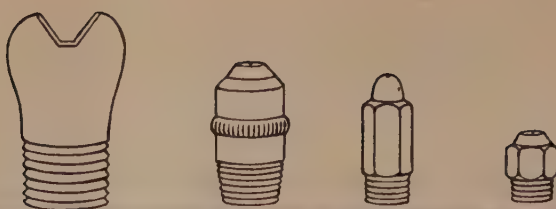
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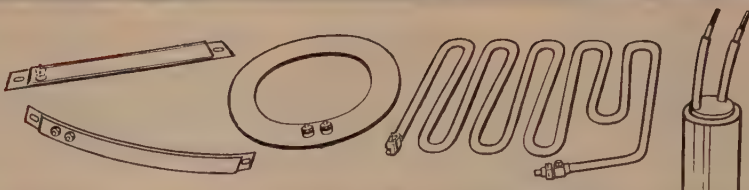
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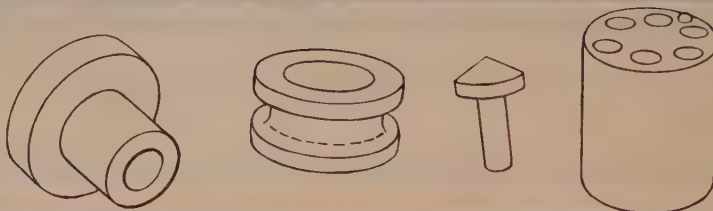
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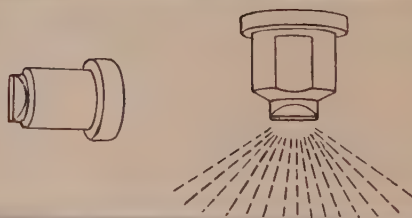
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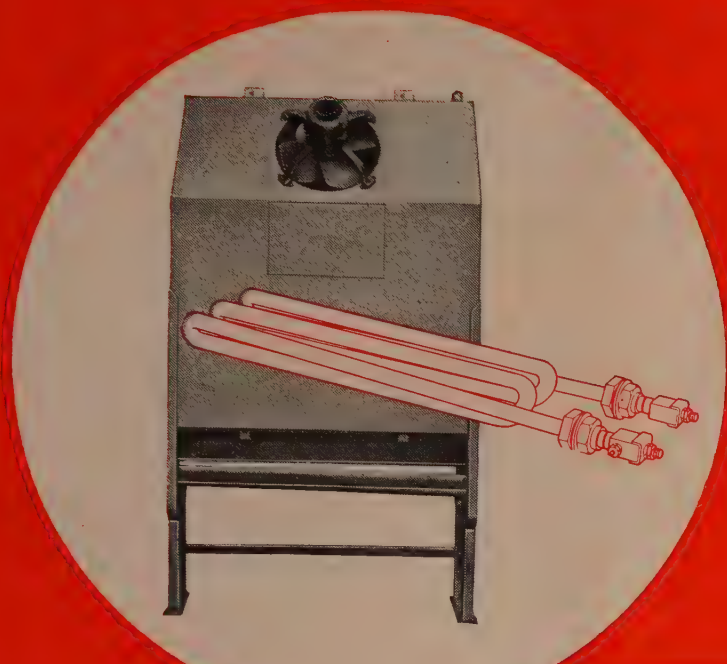
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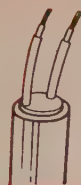
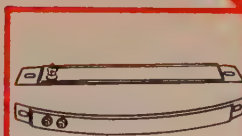


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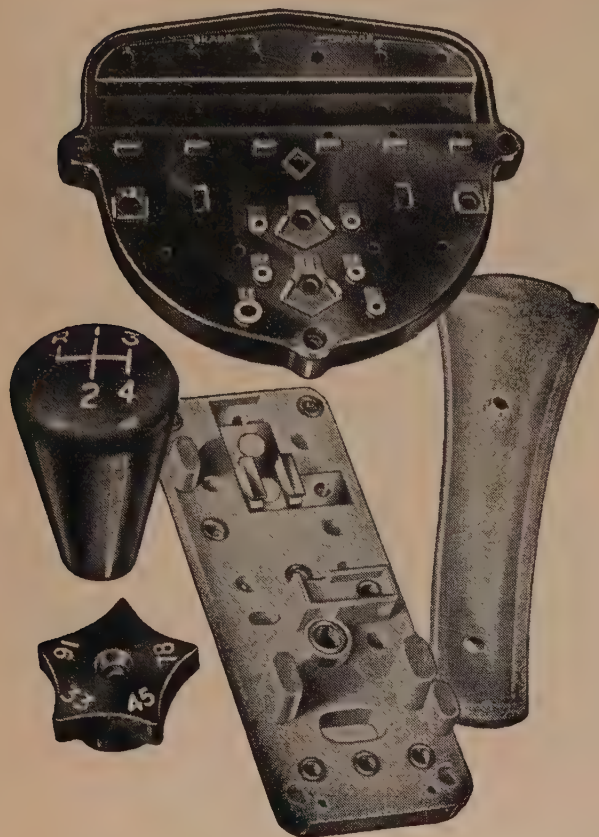
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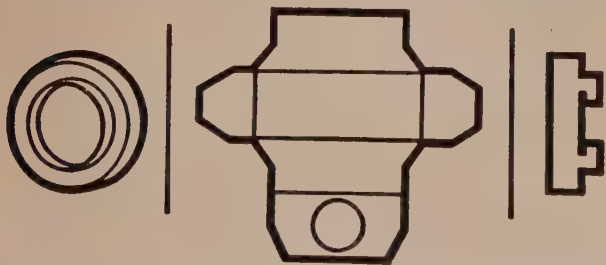
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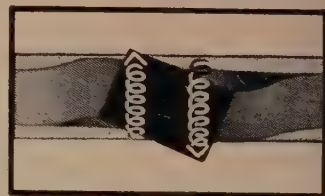
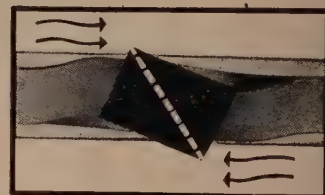
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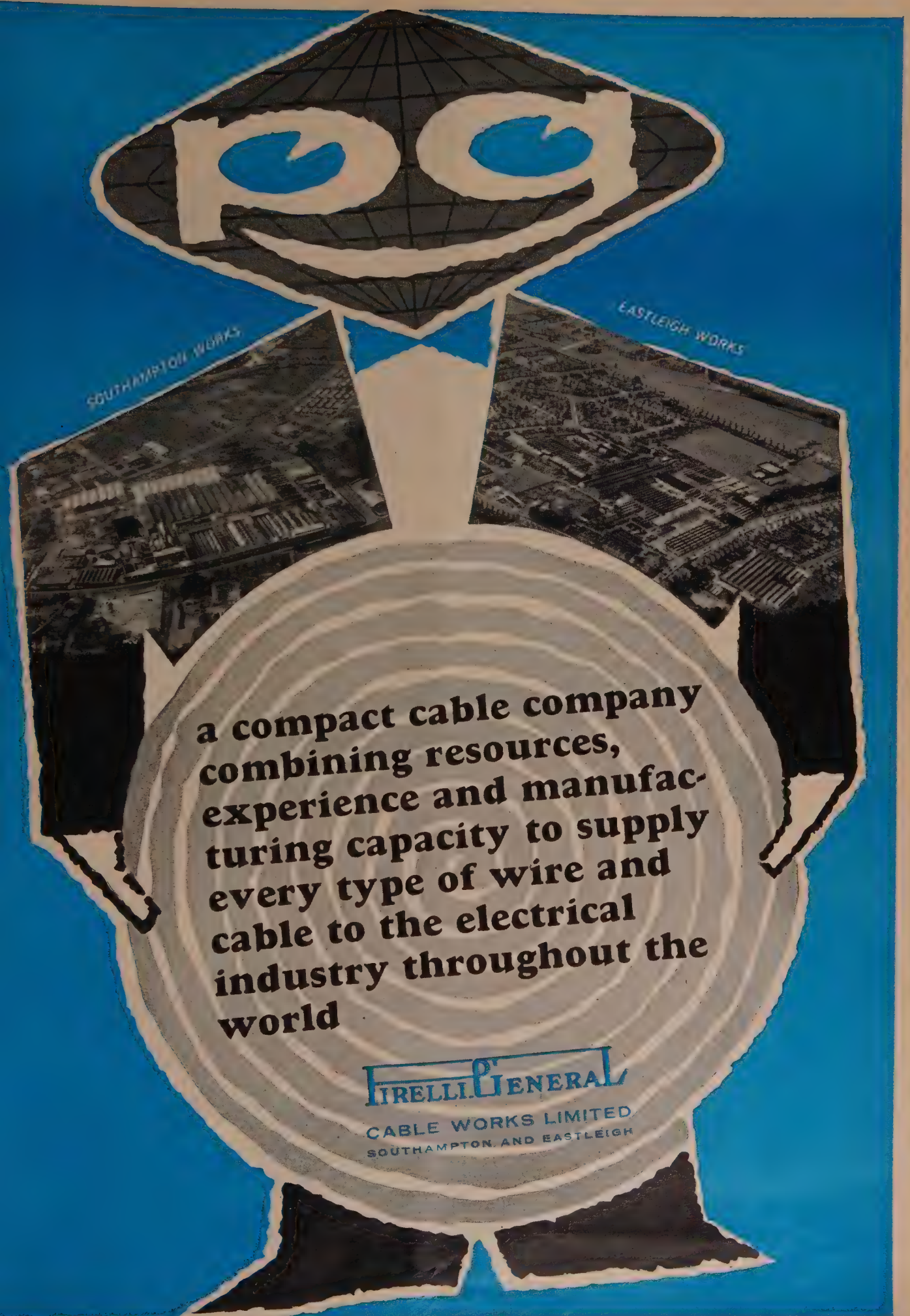
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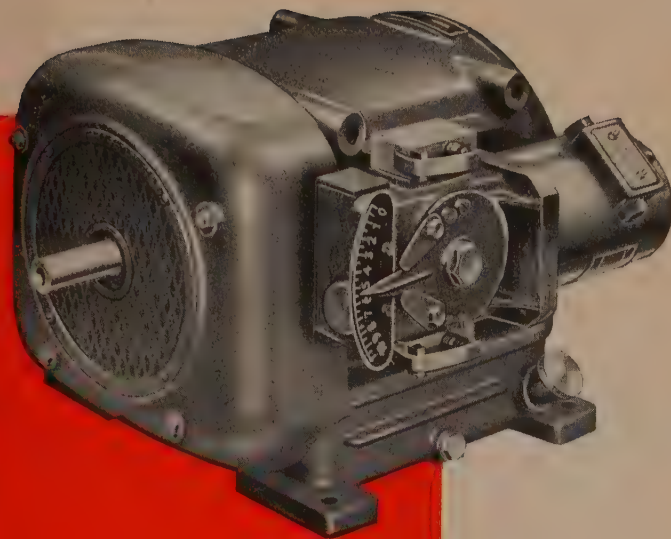
ENGLISH ELECTRIC

fusegear

THE ENGLISH ELECTRIC COMPANY LIMITED, ENGLISH ELECTRIC HOUSE, STRAND, LONDON, W.C.2
Fusegear Division, East Lancashire Road, Liverpool, 10

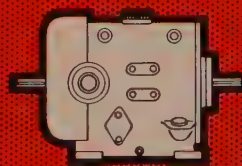
Carter

hydraulic variable speed gears



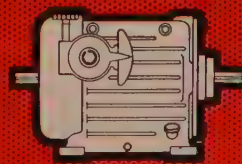
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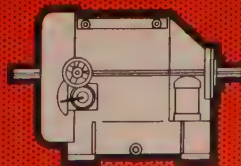
'F' Type Carter Variable Speed Gears. $\frac{1}{4}$ h.p. up to 3 h.p. Handwheel, Hydraulic Relay, Lever or Remote Electrical Controls.

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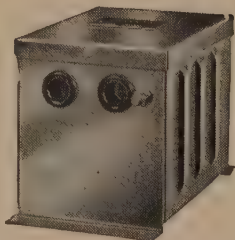
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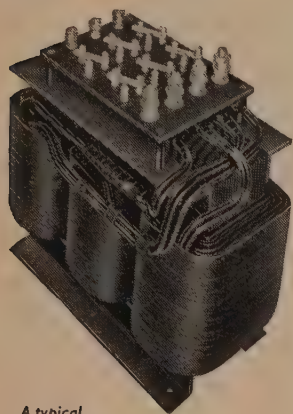
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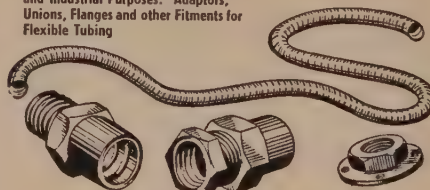
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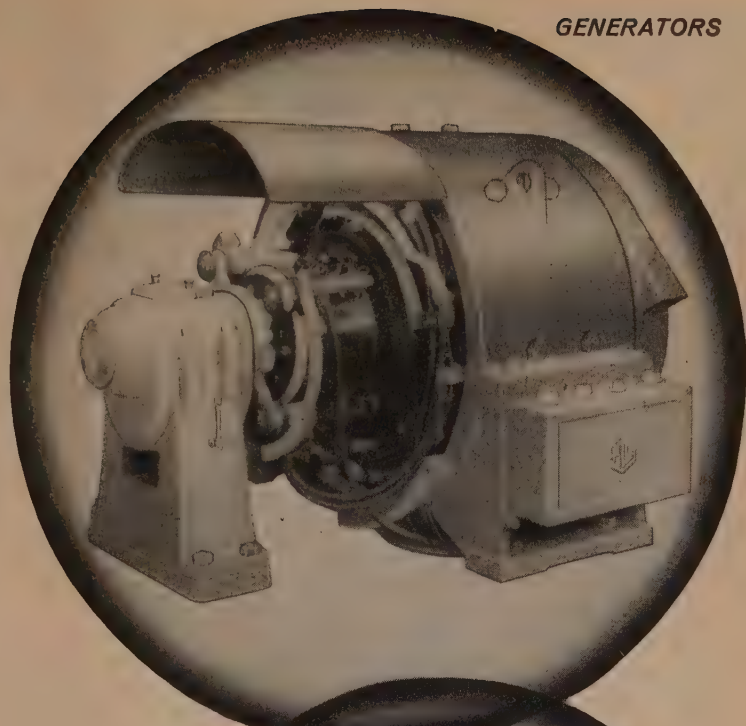
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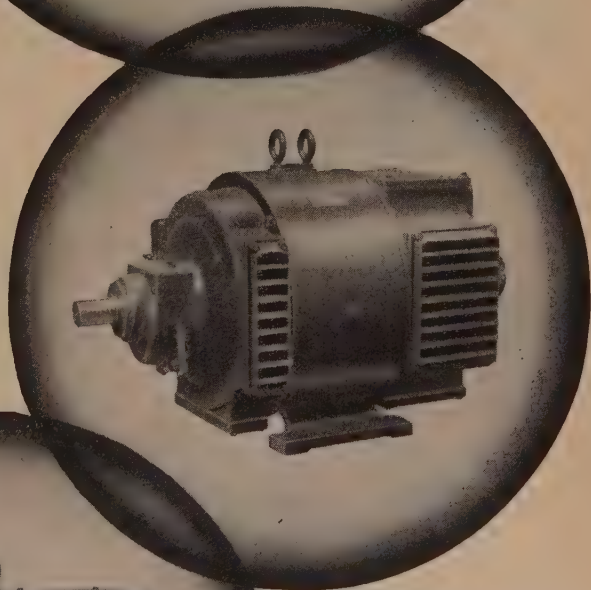
WARD LEONARD SETS

FAN MOTORS

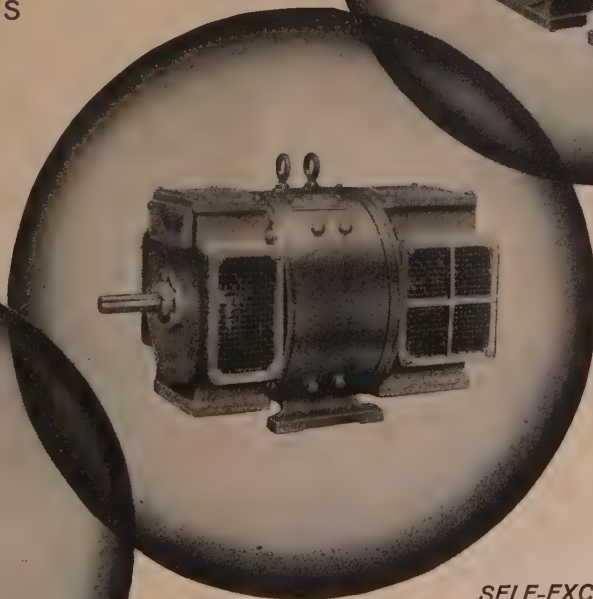
ETC.



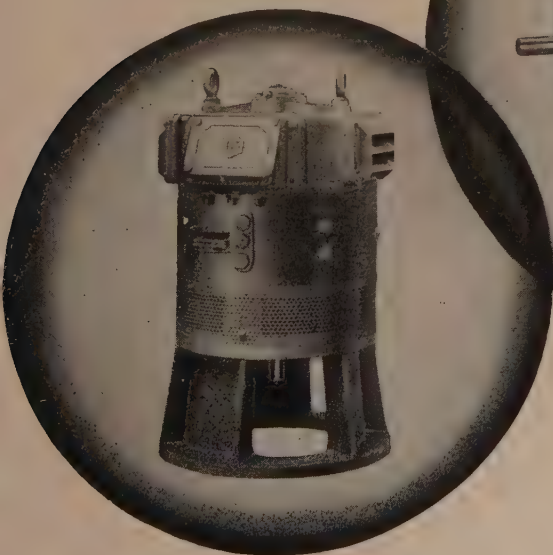
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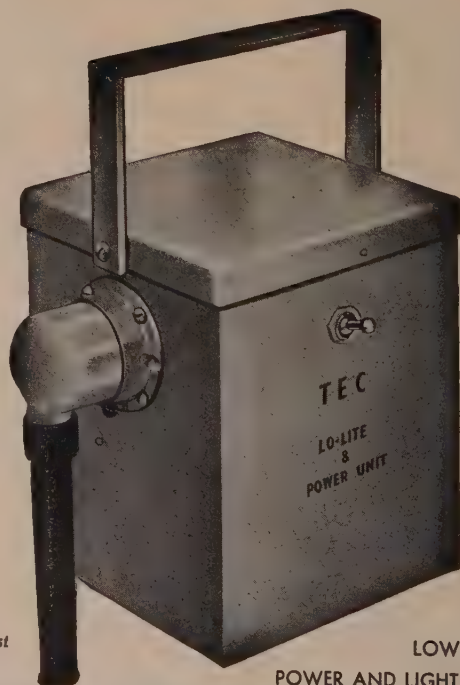
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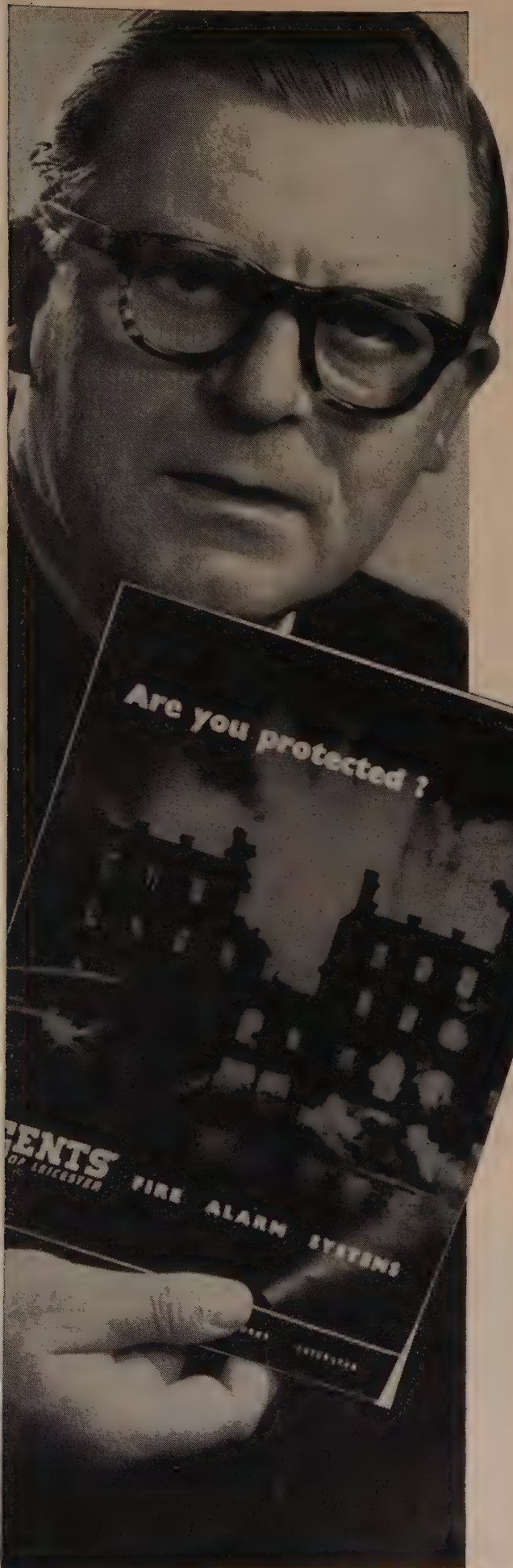
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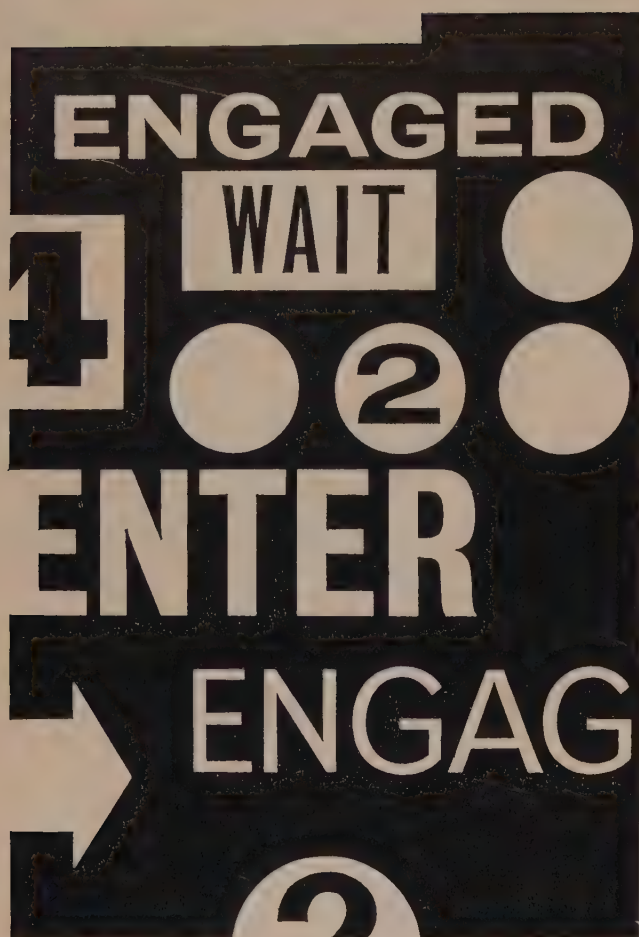
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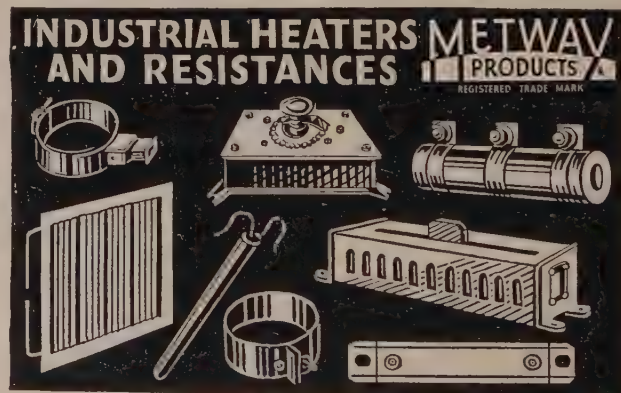
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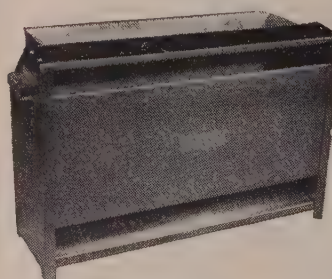
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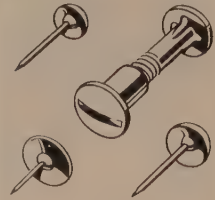
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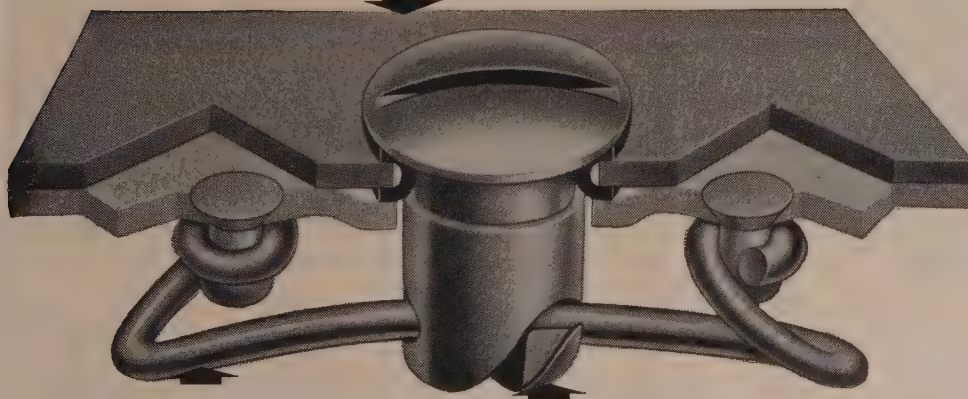
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The locked position. The Dzus Fastener is instantly unlocked by a quarter turn anti-clockwise.



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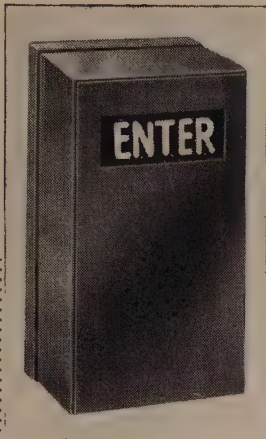
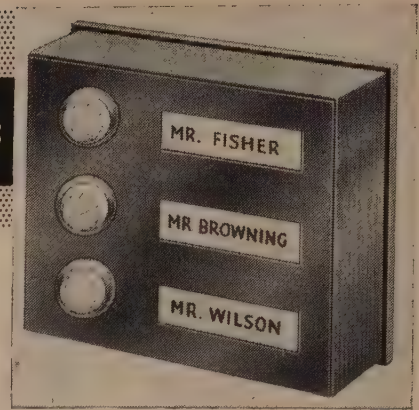
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No. 7321. Ideal for group surgeries, as supplied to Doctors and Hospitals.

On pressing a push an audible signal is made and lamp commences to flash opposite nameplate.

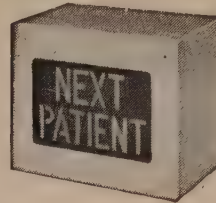
Flashing time adjustable from 3-40 seconds.

Supplied ironclad or woodcase, surface or flush, and in any number of ways.



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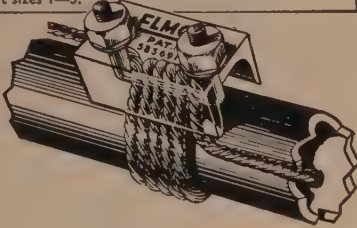
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A COMPLETE RANGE TO B.S.951. 1948
IN 4 SIZES

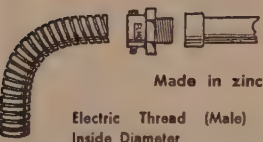
	A123	B45	C67	D8910
for earthing cables up to	7/0.036"	7/0.064"	19/0.064"	19/0.083"
to fit B.S. conduit sizes	1, 2 & 3	4 & 5	6 & 7	8, 9 & 10
i.e. in trade terms	½" to ¾"	1" and 1½"	1½" and 2"	2½" to 3½"

NOTE ALSO: Type A123 is suitable for Earthing Cables up to 7/0.029" and for B.S. conduit sizes 1—5.

"Elmo" Earthing Clamps are of robust construction. Impossible for wire to pull out, always under tension, therefore a most satisfactory earth and a permanent safeguard.



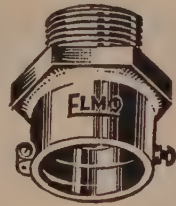
ELECTRICAL FITTINGS



Flexible-to-rigid CONDUIT COUPLINGS

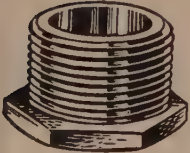
Made in zinc base alloy in the following sizes:

- Electric Thread (Male) ½" ¾" 1" 1½" 1¾" 2"
- Inside Diameter ½" ¾" 1" 1½" 1¾" 2"
- Electric Thread (Male) 1" 1½" 1¾" 2"
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WITH EARTHING TERMINAL

Special Features: Integral Earthing Terminal, tinned ready for soldering. Fixing screw for continuity. Internal Threads suit all makes of flexible tubing.



MALE Hex. Section

CONDUIT BUSHES

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FEMALE Flat Face Section for Spanner (except ¾" size, which is round)



CONDUIT HOOK

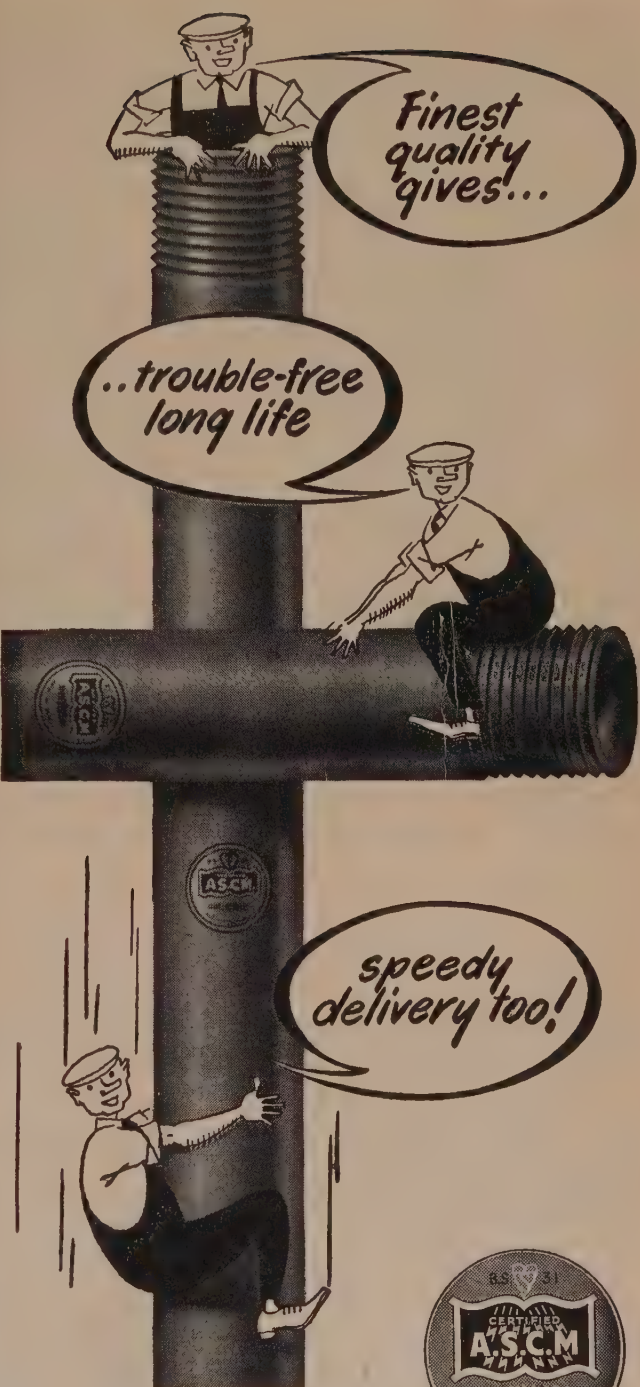
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One hook



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Squirrel cage, Stator/rotor unit, half hour rated and built to BSS 2613. Available with class 'A', 'B' or 'E' insulation.

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Motor, worm and torque measuring spring pack are all on this common shaft, which slides in direct proportion to the torque transmitted to operate the torque switch to shut off the motor.

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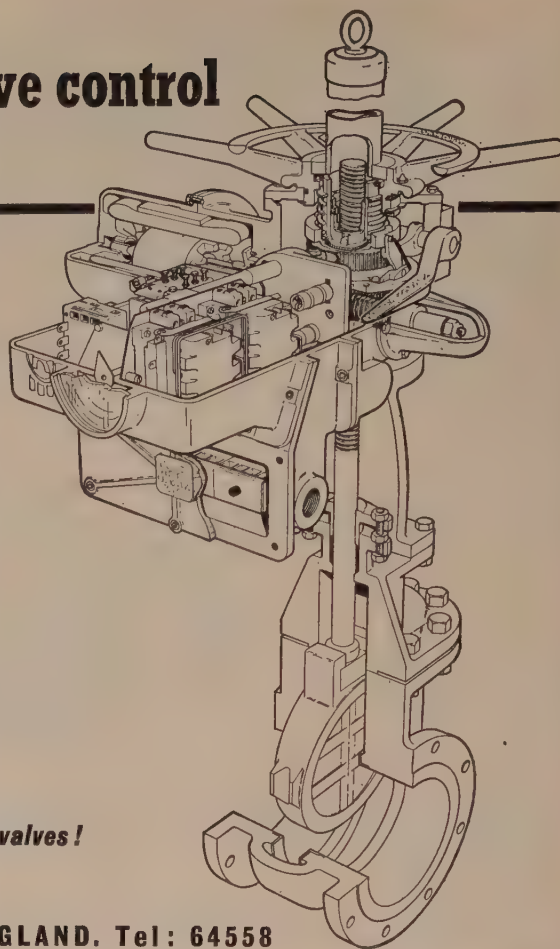
Accurate and efficient, operated directly from the output shaft, the switches can be independently adjusted to operate at any point during valve travel.

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The torque switch is held closed by a coil spring and released when the pre-set torque output is reached; a set screw adjusts the tripping point.

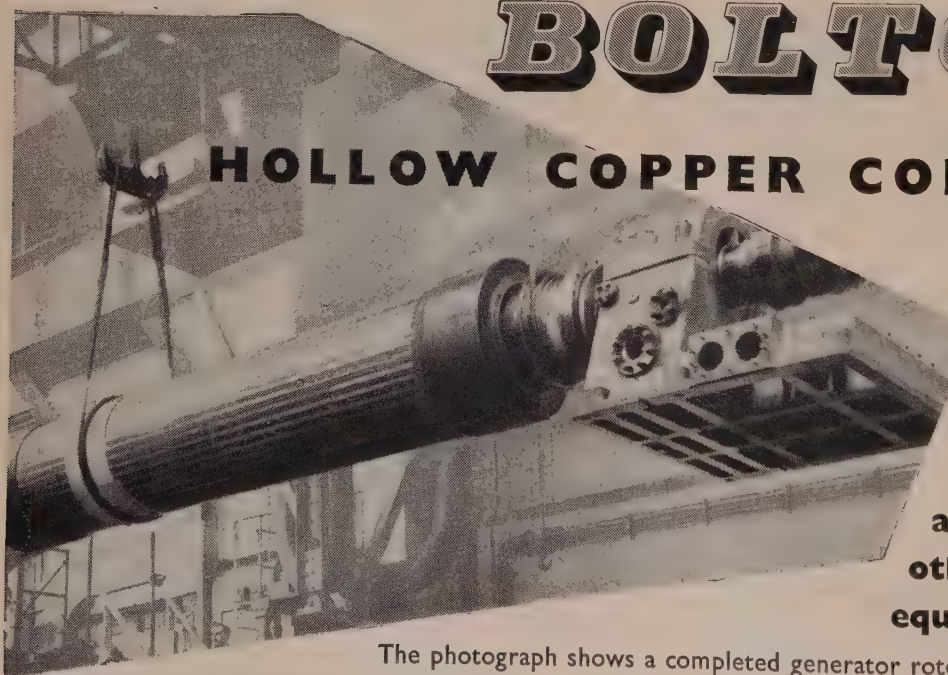
Built-in Starter:

The integral starter illustrated is of Brookhirst Igranic block type 620, reversing contactor



Rotork have a controlling interest in all types of valves!

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C. A. Parsons & Co. Ltd.

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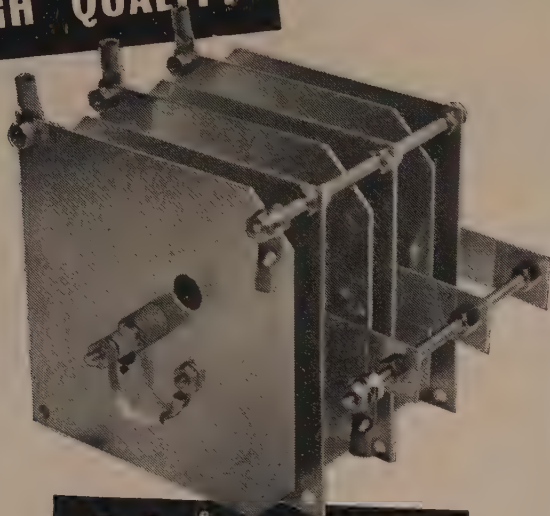
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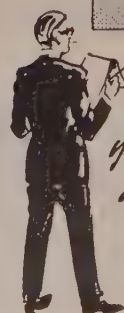
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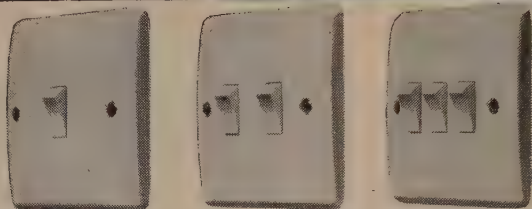
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**ROCKER
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DOLLY**
Flush Switches



These Contactum Flush Switches, which have been accepted by the Council of Industrial Design for "Design Index", look "right" in palace, office, shop or home. Architects and contractors are full of praise for the refinements of design and construction that they embody. Each unit (1-, 2- or 3-gang) fits a single plaster-depth box.

The Rocker Dolly switches are rapidly growing in popularity, and the recently introduced Architrave Switches fill a long-felt need.

MAKE CONTACT WITH
CONTACTUM LTD.
VICTORIA WORKS, EDGWARE ROAD
LONDON, N.W.2
(Phone and Grams: GLAdstone 6366-7)

Getting down

TO LIGHTING MAINTENANCE



L.E.F. Raising and Lowering gear is the perfect answer to every problem posed by interior lighting installations in which the fitting must of necessity be out of reach and, consequently, tricky to service.

This gear enables maintenance staff to bring lighting fittings down to floor level, so that they can be dealt with quickly and conveniently. It out-dates cumbersome methods and is economical in time and labour.

When you have a lighting problem, remember that it is most important to discuss your needs with L.E.F. at the planning stage; first to specify your technical requirements and secondly, to ensure suitable delivery.



**L.E.F.
RAISING &
LOWERING
GEAR**

**LONDON
ELECTRIC FIRM LTD.**

Brighton Road, South Croydon
Surrey
Telephone: Uplands 4871



Lighting units, each weighing over 2 cwt., are serviced by means of L.E.F. Raising & Lowering Gear at the Leysian Mission Hall
Tib 134A



STC

systems and
equipment for the
electrical power
industry

REMOTE CONTROL AND INDICATION
SYSTEMS FOR DISTRIBUTION NETWORKS

TELEPHONE AND TELEGRAPH
SYSTEMS (LOCAL AND NETWORK)

RADIO COMMUNICATION SYSTEMS

AC/DC CONVERSION EQUIPMENT

POWER FACTOR CORRECTION CAPACITORS

COMPUTERS FOR RESEARCH AND ACCOUNTING

COMMUNICATION CABLES



60/10G

Standard Telephones and Cables Limited

TELECOMMUNICATION ENGINEERS

CONNAUGHT HOUSE • 63 ALDWYCH • LONDON W.C.2



TRANSISTORISED POWER SUPPLIES

INPUT VOLTAGE	OUTPUT VOLTAGE	OUTPUT FREQUENCY	OUTPUT POWER
------------------	-------------------	---------------------	-----------------

TYPE A

12VDC or 24VDC	200-250V	50c/s squarewave	75VA to 750VA
For use where a squarewave output waveform is acceptable.			

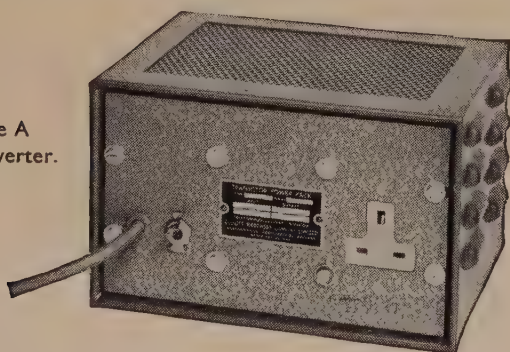
TYPE B

24VDC or 28VDC	200-250V 115V	50c/s sinewave 400c/s sinewave	75VA to 750VA
For use where a strictly sinusoidal output waveform is essential; total harmonic content less than 5%.			

TYPE C

24VDC	240V	2,000c/s	10W or 40W
For battery operated fluorescent lighting; no starters or ballasts required.			

Elliott type A
150 VA inverter.



TYPE D

12VDC or 24VDC	As required	DC	Up to 600W
For H.T. DC supplies.			

TYPE E (1)

12VDC	275V	DC	30W
For receiver power supply; price £15.0.0d.			

TYPE E (2)

12VDC	310V	DC	80W
For transmitter power supply; price £17.10.0d.			

Types E (1) and E (2) have been specially designed to replace the rotary generators or vibrator packs used in mobile VHF transmitter-receivers. They are compact, cheap, require no maintenance and effectively reduce battery drain. Other voltages are available, as required.

Full particulars from

ELLIOTT BROTHERS (LONDON) LTD
TELECOMMUNICATIONS DIVISION

Elstree Way, Borehamwood, Hertfordshire. Telephone Elstree 2040



A member of the Elliott-Automation Group.

ET2

CONTROL GEAR

A.C. and D.C.
for all Industrial purposes

STARTERS
DIRECT ON LINE
PUSH BUTTON
REVERSING
STAR DELTA

REGULATORS
RESISTANCES
RELAYS
CONTACTORS
SWITCHES
ETC.

A full range of Standard Equipment. Special Equipment
designed and made to Customers' requirements.

VULCAN WORKS · 156-170 BERMONDSEY ST · LONDON · S.E.1

'SIMVAR' (VINYL ACETAL)

COVERED WIRES in PACKS



**F.D.
SIMS
LIMITED**

... a product of

P.O. Box 8, Hazelhurst Works, RAMSBOTTOM, via Bury, Lancs.
Telephone: Ramsbottom 2213/4/5. Telegrams: "SIMS" Ramsbottom.
London Office and Stores:
106 Newlands Park, Sydenham, London, S.E.26. Telephone: SYDenham 4211/2

S.56

Two New Water Heater Control Switches

Volex

**D.P. INSULATED
SWITCHES**
WITH EARTH TERMINAL

20 Amp. and 30 Amp.
SURFACE MOUNTING
BROWN OR CREAM FINISH

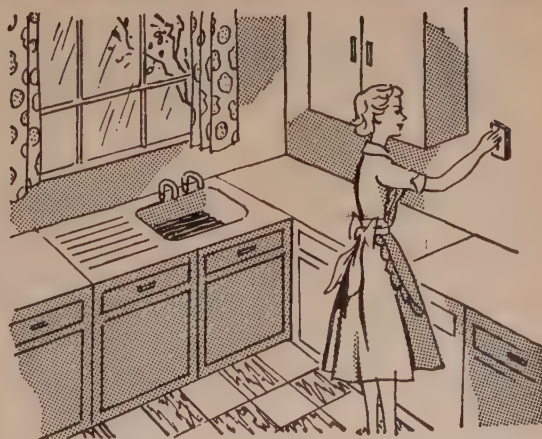
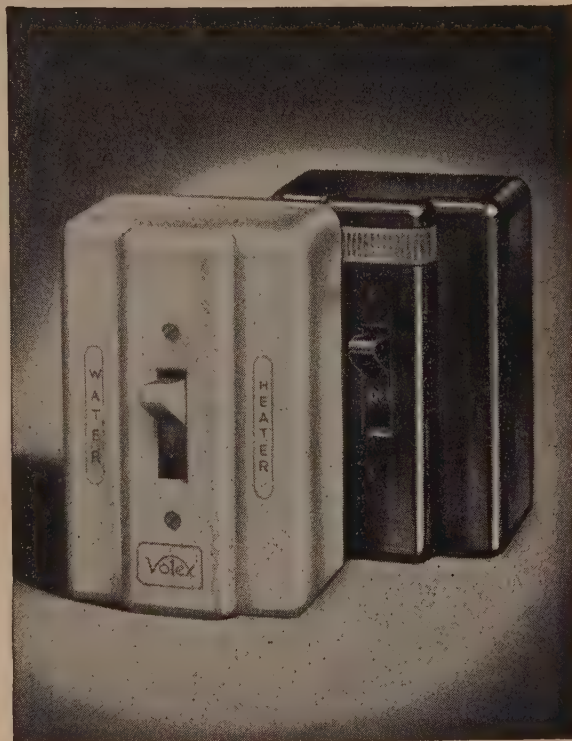
**WITH SELF-CONTAINED
MOUNTING BLOCKS**

20 AMP. A.C.

V/5303 Without Pilot light ... 6/8d. each
V/5303CR „ „ Cream 7/8d. „
V/5304 With Pilot light 9/- „
V/5304CR „ „ Cream 10/- „

30 AMP. A.C.

V/5203 Without Pilot light ... 7/8d. each
V/5203CR „ „ Cream 8/8d. „
V/5204 With Pilot light ... 10/- „
V/5204CR „ „ Cream 11/- „



VOLEX ELECTRICAL PRODUCTS LTD.

SALFORD 6

Telephone: PENDLETON 4373

Telegrams: VOLEXPROD, Salford 6

**R·E·A·L
'CLIPTITE'
CEILING FITTINGS
WITH "PERSPEX" DOME**



Full details of the unique patented fixing method incorporated in "Cliptite" Ceiling Fittings is shown in Catalogue P.5806. Have you received your copy?

Compact and completely dustproof !

The R.E.A.L. "Cliptite" Fitting No. 1222—styled on modern lines and of completely dustproof construction—is ideal for the general overhead illumination of small and medium-size living rooms, entrance halls, corridors, etc, or for any indoor situation where a well-diffused restful light from above is desired. It is, at present, made in two sizes—60 watt and 100 watt—and specifically for ceiling mounting.

Completely dustproof?

YES!

The "Perspex" dome engages firmly against a felt gasket in the ceiling plate.

Fitted or removed in literally a second, the dome is securely sealed in position by stainless steel bayonet catch fittings. Double springing obviates any trace of backlash.

YES!

**definitely
dustproof!**

R E A L

R.E.A.L. is the registered trade mark of
ROWLANDS ELECTRICAL ACCESSORIES LTD.,
R.E.A.L. WORKS, BIRMINGHAM, 18

Classified Advertisements

CLASSIFIED advertisements are PREPAID at 3/6 per line (approx. 6 words).

DISPLAYED CLASSIFIED:—48/- per single column inch.

Where an advertisement includes a Box Number there is an additional charge of 1/-.

SERIES DISCOUNTS for consecutive insertions:—13, 5%; 26, 10%; 52, 15%.

SITUATIONS WANTED:—Three insertions under this heading can be obtained for the price of two if ordered and prepaid with the first insertion.

Cheques and Postal Orders should be crossed and made payable to ELECTRICAL REVIEW PUBLICATIONS LTD.

REPLIES TO BOX NUMBERS should be addressed to the Box Number in the advertisement, c/o ELECTRICAL REVIEW, Dorset House, Stamford Street, London, S.E.1. If an applicant for a situation appearing under a Box Number does not wish his reply to be forwarded to a particular firm or individual, instructions to this effect should be addressed to the Advertisement Supervisor, ELECTRICAL REVIEW. The name of an advertiser using a Box Number cannot be disclosed.

OFFICIAL NOTICES, TENDERS, ETC.

URBAN DISTRICT COUNCIL OF BRAINTREE AND BOCKING

Street Lighting: Group "B"

TENDERS are invited on a FIXED PRICE basis (that is, without cost variation clauses for labour and materials) from contractors experienced in the type of work for:—

1. Taking delivery and erection of 112 Group "B" Prestressed Concrete Columns.
2. Supply, erection and wiring up of 115 45/60-watt Sodium Enclosed Lanterns.
3. The laying of cable ducts across carriage-ways.
4. The dismantling of the existing lighting installation.
5. Incidental works.

Plans, conditions of contract and other documents may be inspected at the office of the Engineer and Surveyor, Town Hall, Braintree, who will also supply specifications, bills of quantities and tender forms upon payment of a deposit of £2 2s., which will be refunded upon the receipt of a bona fide tender and all documents.

Tenders in the plain sealed envelope provided, endorsed "Tenders, Street Lighting," must be delivered to the Clerk of the Council, Town Hall, Braintree, before 12 noon on Friday, the 2nd December, 1960. Specifications and priced bills of quantities must be returned at the same time in sealed envelopes bearing the tenderer's name and address.

The Council does not bind themselves to accept the lowest or any tender.

W. BALSON,

Clerk of the Council.
Town Hall, Braintree, Essex. 6589

MIDDLESEX COUNTY COUNCIL

East Middlesex Main Drainage

Contract Sub. 39: Electrical Installation

TENDERS are invited for the Electrical Installation work at Deepfams Sewage Works, Edmonton, London, N.9.

The installation comprises the cabling for distribution from a power house to the various units on the sewage works. It includes internal wiring, lighting and heating of the power house and other buildings. The contract also covers for the supply of miscellaneous items of electrical plant and for an automatic telephone exchange.

The electricity supply will be 460v/230v. D.C. and 415v./240v. A.C., and tenderers are required to be experienced in handling D.C. equipment.

Tendering documents will be available early in November from the Consulting Engineers, J. D. & D. M. Watson, M.M.I.C.E., 67, Tufton Street, London, S.W.1, upon payment of a deposit of ten guineas, which will be returned on receipt of a bona fide tender and return of all documents. Cheques should be made payable to J. D. & D. M. Watson.

The Council does not bind itself to accept the lowest or any tender.

Tenders must be delivered to the Consulting Engineers not later than 24th November, 1960.

KENNETH GOODACRE,
Clerk of the County Council.

County Council of Middlesex,
Westminster, London, S.W.1. 6590

COUNTY BOROUGH OF WIGAN

To Electrical Contractors

27 Dwellings, Drummond Square Site,
Laithwaite Housing Estate

TENDERS are invited from experienced Electrical Contractors for the COMPLETE WIRING INSTALLATIONS of the dwellings in the above scheme.

The specification and particulars of the electrical installations can be obtained on application to the Borough Engineer, Municipal Buildings, Hewlett Street, Wigan, on payment of a deposit of £1 1s. (cheques payable "Wigan Corporation"), which will be refunded on receipt of a bona fide tender.

Tenders must be submitted in the endorsed official envelope provided for the purpose, which must be sealed and delivered to the undersigned not later than 10 a.m. on Wednesday, the 16th November, 1960.

All tenders must allow for being subject to the Council's Standing Orders concerning contracts which include a requirement for the provision of sureties.

The Council does not bind itself to accept the lowest or any tender.

ALLAN ROYLE,

Municipal Buildings, Wigan. Town Clerk. 6444

OXFORD CORPORATION WATER UNDERTAKING

Supply and Erection of Electrically Driven Pumping Plant at Swinford Pumping Station

Contract No. 24

TENDERS are invited from Pump Contractors with the necessary experience for the supply and erection of two High Lift Pumping Units with an output of 3,500 g.p.m. and two Low Lift Pumping Units with an output of 3,850 g.p.m.

The contract will include for the supply of electric motors, switchgear, cabling and ancillary works.

Contract documents may be obtained from the City Water Engineer, 65, St. Aldate's, Oxford.

Sealed tenders must be returned in accordance with the instructions by 12 noon on 1st February, 1961.

The City Council does not bind itself to accept the lowest or any tender.

HARRY PLOWMAN,

Town Hall, Oxford. Town Clerk. 6593

FYLDE WATER BOARD

Sludge Freezing Plant, Hodder Works, Slaidburn

TENDERS are invited from suitable manufacturers for the supply and delivery of a Fuse Control Switchboard for controlling 40-h.p. compressor motor and station auxiliaries.

Further particulars from Engineer to the Fylde Water Board, Sefton Street, Blackpool.

Tenders to be received not later than 18th November, 1960. 6545

CITY OF MANCHESTER

Davyhulme Sewage Works

TENDERS invited for supply, delivery and installation of Outside Lighting of Existing Aeration Plants.

Tender documents from City Surveyor, Town Hall, Manchester, 2. Tenders returnable by 5th December, 1960. 6557

Advertisements are accepted up to first post on Monday of the week of issue

If blocks, bold type or ruled borders are required then on Friday prior to week of issue

All communications to be addressed to:
Classified Advertisement Department,
ELECTRICAL REVIEW
Dorset House, Stamford Street
London, S.E.1

Original testimonials should not be sent with applications for employment

SELBY URBAN DISTRICT COUNCIL

Street Lighting: Group A

TENDERS are invited for the supply of the following street lighting equipment:—

- (a) Supply of 30 140-watt totally enclosed Sodium Lanterns and auxiliary equipment.
- (b) Supply of 22 Prestressed Spun Concrete Street Lighting Columns.
- (c) Supply of 8 Steel Columns to B.S.S. 1775.

Each of the above items will be the subject of a separate tender and applications for bills of quantities, specifications, etc., indicating for each item for which it is proposed to tender should be made to the undersigned.

Sealed tenders, endorsed "Street Lighting," to be delivered to W. H. Spashett, Clerk of the Council, 12, Park Street, Selby, not later than 12 noon on 21st November, 1960.

The Council do not bind themselves to accept the lowest or any tender.

H. E. PHILLIPS, M.I.Mun.E.,
Engineer and Surveyor.

Council Offices,
12, Park Street, Selby.
27th October, 1960. 6567

WELSH COLLEGE OF ADVANCED TECHNOLOGY

Cathays Park, Cardiff

Supply of Analogue Computer

FIXED Price Tenders are invited for the supply of a general-purpose Electronic Analogue Computer incorporating 10 amplifiers.

Tenders will not be considered unless enclosed in the envelope provided, endorsed "Welsh College of Advanced Technology, Laboratory Equipment," addressed to the UNDERSIGNED at the City Hall, Cardiff, and sent by REGISTERED POST so as to be received not later than 28th November, 1960.

The envelope must not bear the name of or any mark indicating the identity of the tenderer.

The Governors do not bind themselves to accept the lowest or any tender.

Further details and form of tender are available on application to the Principal, at the College.

ROBERT E. PRESSWOOD,
Clerk to the Governing Body.

City Hall, Cardiff. 6592

CORPORATION OF THE CITY OF ABERDEEN

Lighting Department

TENDERS are invited for the supply of Electric Lamps to the Aberdeen Corporation Lighting Department during the year 1961. Tender forms and details may be obtained from the Superintendent of Lighting, 262, King Street, Aberdeen, to whom tenders should be submitted on or before 28th November, 1960.

J. C. RENNIE,
Town Clerk.

Town House, Aberdeen.
26th October, 1960. 7654

Official Notices (continued)**HAMPSHIRE COUNTY COUNCIL****Eastleigh Technical College**

TENDERS are invited for the supply of Science Equipment, Metal and Wood Cutting Machine Tools and Hand Tools for Engineering and Building National Certificate and Craft Courses.

Schedules and forms of tender may be obtained from the Principal, Eastleigh Technical College, Cranbury Road, Eastleigh, and returned as directed to the Clerk of the County Council, The Castle, Winchester, by noon on 28th November, 1960. 6566

SITUATIONS VACANT

(See "Replies to Box Numbers" on page 99)

CENTRAL ELECTRICITY GENERATING BOARD**London Division**

APPLICATIONS invited for the following superannuable post. Conditions of service in accordance with N.J.B. Agreement, Schedule B. Salary includes London allowance. Qualifications entitling to Graduate Membership of the I.E.E. or I.Mech.E. an advantage.

THIRD ASSISTANT ENGINEER, ELECTRICAL DEPARTMENT, ISLINGTON POWER STATION (Vacancy No. 60/884).

The successful candidate will take charge of a workshop and team of electrical fitters engaged on installation work in Grid substations and generating stations. Candidates should have a thorough experience of electrical installation work with particular reference to wiring of control and relay panels. Salary Class BX, Grade 8 = from £1,760, £1,155-£1,460; from £1,761, £1,195-£1,460 per annum.

Applications, quoting vacancy number, may be made (on the standard form) or to Personnel Officer, Central Electricity Generating Board, London Division, P.O. Box 136, London, W.1, by 15th November, 1960. 6560

GHANA CIVIL SERVICE

APPLICATIONS are invited for the post of **ELECTRICAL ENGINEER** in the **ELECTRICITY DEPARTMENT**.

Duties: To take charge of, or assist in, the operation and maintenance of electricity supplies of voltages up to 11,000 volts.

Qualifications: Candidates (1) must possess a B.Sc.(Eng.) or other recognised degree in electrical engineering and must have had not less than two years' practical postgraduate training or professional experience in electrical power generation and distribution, E.H.T. and L.T. systems and consumers' installations; or (2) being not less than 23 years of age, must have passed Parts I, II and III of the examinations of the Institution of Electrical Engineers and have gained not less than two years' practical postgraduate experience in electrical power generation and distribution, E.H.T. and L.T. systems and consumers' installations; (3) preference will be given to candidates with knowledge of compression ignition engines and the design of E.H.T. and L.T. distribution systems. Salary in range £1,080-£2,080 p.a.

Appointment is on contract terms for two tours each of 15-18 months. Gratuity £150 p.a. Free passages for officer, wife and up to three children under 18 years, and in addition an education allowance for children when not resident in Ghana and attending full-time school of £100 a child for up to 3 children under 18 years. Accommodation at low rental. Interest-free advance for car and car maintenance allowance may be granted. Generous leave on full pay. Income tax at low local rates.

For application forms, please send **POSTCARD** to the **DIRECTOR OF RECRUITMENT, GHANA HIGH COMMISSION, 248, TOTTENHAM COURT ROAD, LONDON, W.1.**

6595

EASTERN ELECTRICITY BOARD

APPLICATIONS are invited for the following appointments. The successful candidate will be required to contribute to a superannuation scheme and may be required to undergo a medical examination.

Chilterns Sub-Area

HEMEL HEMPSTEAD DISTRICT TWO FOURTH ASSISTANT ENGINEERS (284/60.R.).

Candidates should have had a sound technical training and suitable experience in the construction, operation and maintenance of H.V. and L.V. overhead and underground distribution systems, including substations.

Salary N.J.B. Class F, Grade 11 (£765-£870).

Apply by letter to the Manager, Hemel Hempstead District, Eastern Electricity Board, Bridge Street, Hemel Hempstead, Herts, by 18th November, 1960.

Northmet Sub-Area

THIRD ASSISTANT ENGINEERS

(a) **HENDON DISTRICT (Ref. 1011)**

(287/60.R.).

(b) **ST. ALBANS DISTRICT**

Two posts (Ref. 975 and 987) (286/60.R.).

Candidates should have had a sound technical training and suitable experience in the construction, operation and maintenance of H.V. and L.V. distribution systems including substations.

Salary N.J.B. Class G, Grade 9 (£965-£1,090), plus London allowance for post (a).

Apply by letter by 14th November, 1960, to:—

(a) **F. A. Moinet, M.I.E.E., Eastern Electricity Board, Northmet Sub-Area, 137/139, Brent Street, Hendon.**

(b) **F. J. Drake, Assoc.I.E.E., Manager, Eastern Electricity Board, 107, St. Peter's Street, St. Albans.**

HENDON DISTRICT

FIRST ASSISTANT DISTRICT ENGINEER (Ref. 1010) (285/60.R.).

Applicants should have had a sound training in electrical engineering and considerable experience in the design, construction, operation and maintenance of underground distribution systems, including substations, up to and including 33 kV. Corporate Membership of the Institution of Electrical Engineers will be an advantage.

Salary N.J.B. Class G, Grade 5 (£1,275-£1,410), plus London allowance.

Apply by letter to **F. A. Moinet, M.I.E.E., Manager, Eastern Electricity Board, 137/139, Brent Street, N.W.4, by 14th November, 1960.**

SUB-AREA HEADQUARTERS,

LONDON, N.14

GENERAL ASSISTANT ENGINEER

(Senior Draughtsman)

Civil Engineering and Building Section

Sub-Area Engineer's Department

(Ref. 1012) (288/60.R.).

The successful candidate will be responsible for the preparation of drawings for building and civil engineering work for 11 and 33 kV substations, offices, showrooms and workshops, etc., and should be capable of carrying out site surveys and supervising drawing office staff.

Possession of the Ordinary National Certificate (Building) or equivalent qualification will be an advantage.

Salary N.J.B. Class N, Grade 15 (£1,015-£1,140) inclusive of London allowance.

Apply by letter to the Manager, Eastern Electricity Board, Northmet Sub-Area, Northmet House, Southgate, London, N.14, by 21st November, 1960. 6600

NORTH WESTERN ELECTRICITY BOARD

Third Assistant District Engineer (Testing), West Lakeland District

APPLICATIONS should be capable of inspecting, testing and commissioning all kinds of switchgear, transformers, etc., and particularly must have an intimate knowledge of protective systems.

Possession of the H.N.C. in Electrical Engineering would be an advantage.

Salary scale £965 x £25 to £1,090 p.a., Grade G.9. N.J.B. conditions.

Application forms to be obtained from the Manager, No. 6 Sub-Area, North Western Electricity Board, Castle Green, Kendal, and returned to him by 14th November, 1960. 6561

MECHANICAL ENGINEER

**THE BAHRAIN PETROLEUM COMPANY LIMITED**

require a

MECHANICAL ENGINEER

for their Power and Utilities Department

The need is for a young single or married man, preferably not over 28 years of age, who should be a graduate of the Institution of Mechanical Engineers and have had at least two years' experience in power plants or similar works. Graduate members of the Institution of Electrical Engineers or graduates with a B.Sc. in Engineering who have had the necessary practical experience would also be considered.

The successful applicant will be required for work connected with the operation and control of high pressure boilers, straight condensing and extraction turbogenerators, utility steam raising plants, etc. He may also be required to work on the high voltage electrical distribution systems and on extensive refinery utilities distribution systems.

The commencing salary will be dependent upon qualifications and experience, in addition to which the following are provided:—



FREE AIR-CONDITIONED ACCOMMODATION · LIVING ALLOWANCE

INITIAL KIT ALLOWANCE · FREE MEDICAL ATTENTION

PAID HOME AND LOCAL LEAVES

(passages paid for the former and generous assistance towards the latter).

PENSION AND PROVIDENT FUND SCHEMES



Apply in writing with full particulars, quoting "ETS/PU" to

CALTEX SERVICES LIMITED

Calter House, Knightsbridge Green, London, S.W.1.

6539

Ferranti transformers

Vacancies exist for

**SENIOR & JUNIOR TRANSFORMER DESIGNERS
DEVELOPMENT ENGINEERS · DRAUGHTSMEN**

in the Manchester branches of the Company

Necessary qualifications are:-

FOR DESIGN AND DEVELOPMENT

applications will be considered from holders of honours or pass degrees in Electrical Engineering or Physics, or of H.N.C. in Electrical Engineering. For Senior Design vacancies previous experience of transformer design is desirable.

FOR DRAWING OFFICE

H.N.C. in Mechanical Engineering is desirable and experience of transformer work or of the design of welded structures would be an advantage.

These vacancies offer EXCELLENT PROSPECTS AND HIGH TECHNICAL INTEREST. Successful candidates will be joining the foremost British transformer manufacturing company, with advantages of:-

- THE MOST UP-TO-DATE DESIGN AND DEVELOPMENT FACILITIES
- TECHNICAL LEADERSHIP
- A MANUFACTURING CAPACITY OF OVER 5,000,000 kVA PER ANNUM
- WORLD-WIDE INTERESTS

They will have the opportunity of being associated with activities such as:-

The recent order for one of the first two 380 kV 400 MVA transformers for the C.E.G.B., the almost completed contract for the 330kV transmission transformers for the Kariba Dam Scheme etc.

The use of high voltage equipment such as 4,000,000 Volt and 1,500,000 Volt impulse generators, a Pegasus 2 computer etc.

MAJOR CONTRACTS IN TRANSFORMERS AND HIGH VOLTAGE EQUIPMENT IN 5 CONTINENTS.

Applicants should send brief details of their qualifications and experience to:-

**T. J. LUNT, Staff Manager
Ferranti Ltd., Hollinwood, Lancs.
and quote reference FWG**

Interviews will take place shortly and may be arranged for Saturday, if requested.

Situations Vacant (continued)**CENTRAL ELECTRICITY
GENERATING BOARD****East Midlands Division****ASSISTANT SHIFT CHARGE
ENGINEER, DRAKELOW "B"
POWER STATION**
(Vacancy No. 252/60).

Applications are invited for the position of Assistant Shift Charge Engineer at Drakelow "B" Power Station, near Burton-on-Trent, Staffs.

Applicants should have received a sound technical training and have had experience in a modern power station. Preference will be given to candidates who possess the Higher National Certificate, or its equivalent.

Salary will be in accordance with Class L, Grade 8 (£1,350-£1,500 per annum) of the National Joint Board Agreement, plus 10% allowance for shift duties.

Closing date for receipt of applications, 19th November, 1960.

**SECOND ASSISTANT STATION
CHEMIST, WILLINGTON "A" &
"B" POWER STATION**
(Vacancy No. 243/60).

Applications are invited for the position of Second Assistant Station Chemist at Willington "A" and "B" Power Station, P.O. Box 27, Derby.

It is desirable that applicants have a University Degree or Associateship of the Royal Institute of Chemistry and experience in general chemical analysis, with particular experience in the use of physico-chemical apparatus such as U.V. spectro-photometer, and a knowledge of statistical methods.

Salary will be in accordance with Class M, Grade 11 (£1,190-£1,325 per annum) of the National Joint Board Agreement.

Closing date for receipt of applications, 12th November, 1960.

**SHIFT CHARGE ENGINEER,
DERBY POWER STATION**
(Vacancy No. 244/60).

Applications are invited for the position of Shift Charge Engineer at Derby Power Station, Full Street, Derby.

Applicants should have a sound technical training and considerable experience in a modern power station. Preference will be given to candidates who are Graduate Members of the Institution of Electrical or Mechanical Engineers or who hold similar qualifications. A knowledge of pulverised fuel firing will be an advantage.

Salary will be in accordance with Class F, Grade 7 (£1,040-£1,165 per annum) of the National Joint Board Agreement, plus 10% allowance for shift duties.

Closing date for receipt of applications, 12th November, 1960.

**SHIFT CHARGE ENGINEER,
WILLINGTON "A" POWER STATION**
(Vacancy No. 245/60).

Applications are invited for the position of Shift Charge Engineer at Willington "A" Power Station, P.O. Box 27, Derby.

Candidates should have had a sound technical training and considerable experience in a modern power station. Preference will be given to candidates who are Graduate Members of the Institution of Electrical or Mechanical Engineers or who hold similar qualifications. A knowledge of pulverised fuel firing will be an advantage.

Salary will be in accordance with Class L, Grade 6 (£1,535-£1,720 per annum) of the National Joint Board Agreement, plus 10% allowance for shift duties.

Closing date for receipt of applications, 12th November, 1960.

**ASSISTANT SHIFT CHARGE
ENGINEER,
COVENTRY POWER STATION**
(Vacancy No. 247/60).

Applications are invited for the position of Assistant Shift Charge Engineer at Coventry Power Station, Alderman's Green, Coventry.

Applicants are required to take charge of shift operation of boiler house plant and must possess a sound technical training, a good general engineering experience, and knowledge of the control and operation of water tube boilers, ancillary plant and the efficient combustion of chain grate stokers.

Salary will be in accordance with Class G, Grade 9 (£965-£1,090 per annum) of the

National Joint Board Agreement, plus 10% allowance for shift duties.

Closing date for receipt of applications, 12th November, 1960.

**GENERAL ASSISTANT ENGINEERS,
SPONDON POWER STATION**
(Vacancy No. 248/60).

Applications are invited for the positions of General Assistant Engineers at Spordon Power Station, near Derby.

Candidates should be suitably qualified young men who are interested in power station operation and/or maintenance as a career.

Facilities are available whereby experience can be obtained in all sections of a large modern power station, and the prospects of advancement are real to those who are willing to take advantage of the opportunities.

The salary during the initial training period will depend on qualifications and knowledge, and will be within the range £625-£805 per annum of the National Joint Board Agreement.

Closing date for receipt of applications, 12th November, 1960.

**GENERAL ASSISTANT
ENGINEERS (Chemists),
SPONDON POWER STATION**
(Vacancy No. 249/60).

Applications are invited for the positions of General Assistant Engineers (Chemists) at Spordon Power Station, near Derby.

Candidates must have had a sound technical training and previous laboratory experience and should preferably hold the Higher National Certificate in Chemistry, but consideration will be given to candidates studying for that qualification.

The salary will be within the range £625-£805 per annum of the National Joint Board Agreement.

Closing date for receipt of applications, 12th November, 1960.

These appointments will be pensionable within the terms and conditions of the Electricity Supply (Staff) Superannuation Scheme.

Applications should be submitted on the official form AE6/ACT, which may be obtained from the Station Superintendent concerned and should be returned to him by the date stated.

O. S. WOODS,
Divisional Controller. 6574

**BATTERSEA COLLEGE OF
TECHNOLOGY, LONDON, S.W.11**
(An Advanced College of Technology)

APPLICATIONS are invited from graduates of a British University for two GRADE B LECTURER positions in the Department of Electrical Engineering.

The salary is within the range £858 to £1,486. Research facilities are available.

Further particulars from the Clerk to the Governing Body, by whom applications should be received as soon as possible. 6562

**ADMIRALTY - NAVY WORKS DEPARTMENT
ELECTRICAL AND MECHANICAL ENGINEERING DRAUGHTSMEN**

Vacancies exist in Navy Works Department Drawing Offices as shown below and occur at Establishments elsewhere in United Kingdom from time to time.

The posts are non-pensionable but there will be opportunities for transfer to the Established staff.

Applicants must be competent Draughtsmen and experienced in one or more of the following types of work:-

Electrical (Vacancies at Pinner (Middx.), Portland and Devonport)

(a) Preparation of specifications, drawings and schedules for electrical equipment. Precise of Firms' tenders.

(b) Electrical installations in domestic and industrial buildings.

(c) Cable installations, switchgear, etc.

(d) Airfield lighting.

Mechanical (Vacancies at Pinner (Middx.), Portsmouth, Portland, Liverpool, Rosyth, London).

(a) Preparation of specifications, drawings, schedules and precise of Firms' tenders.

(b) District heating, including boiler installations, heating and air conditioning of domestic and specialist buildings.

(c) Layouts of engineering installations and workshop machinery.

(d) All classes of lifting appliances, pumping installations, test plants, cooking equipment, etc.

Possession of O.N.C. or similar qualification will be an advantage. Consideration will be given to successful candidates being granted assistance to obtain technical qualifications.

Salary (Men): National Rate—subject to slight variation dependent on location: starting from £580 (at age 21) to £870 (28 and over); maximum of scale—£955 p.a. (National Rate).

Opportunities occur for promotion to Leading grade—salary maximum £1,115 p.a. (National Rate).

Five day week: annual leave 18 days rising to 22 after 10 years.

Candidates, who must be British subjects, are invited to apply in writing, giving details of qualifications and experience to Director General, Navy Works, Admiralty, Chamberlain Way, Pinner, Middlesex. 6544

NORTH EASTERN ELECTRICITY BOARD

APPLICATIONS are invited for the following appointments:-

**Area Board Headquarters,
Chief Engineer's Dept., Carlisle House,
Newcastle upon Tyne**

THIRD ASSISTANT ENGINEER, Construction Section. Applicants should have had experience in design and testing of transformers and regulators. Duties will include the specification and checking of drawings, including tap change control diagrams.

Salary Schedule B, Grade AX8/AX7, £1,105/£1,410 according to experience. N.J.B. conditions.

Wear Sub-Area

FIRST ASSISTANT DISTRICT COMMERCIAL ENGINEER, Stanley Service Centre. Applicants should preferably be Graduate or Corporate Members of I.E.E. or possess equivalent qualifications in electrical engineering, and have experience in utilisation of electrical energy in commercial and domestic premises, knowledge of installation work, and be conversant with tariffs, sales and all aspects of consumers' service.

Salary Schedule A, Class F, Grade 5, £1,190/£1,325. N.J.B. conditions.

SENIOR DEMONSTRATOR at Sunderland. Applicants should have a certificate of a recognised domestic training college and/or E.A.W. Certificate, preferably the latter; also considerable experience as a demonstrator in the electricity supply industry.

Salary Grade 2, £700/£775 according to qualifications and experience. N.J.C. conditions.

Applications stating age, qualifications and experience to be received by Assistant Secretary (Establishments), North Eastern Electricity Board, G.P.O. Box No. 117, Carlisle House, Newcastle upon Tyne, within ten days of the appearance of this advertisement. 6577

OLDHAM EDUCATION COMMITTEE**Municipal Technical College**

APPLICATIONS are invited for the post of GRADE B ASSISTANT in the Electrical Engineering Department to teach subjects in Radio and Television Servicing. Candidates must have good industrial experience and/or teaching experience.

Salary in accordance with the Burnham (Further Education) Scale as follows: Grade B Assistant (men, £700 x £27 10s. to £1,150 per annum, with additions for graduate qualifications, etc.). Starting salary on a point fixed within this scale.

Further particulars and forms of application (to be returned within two weeks of the appearance of this advertisement) from the Director of Education, Education Offices, Union Street West, Oldham. 6548

ELECTRICITY CORPORATION OF NIGERIA

45

VACANCIES FOR

UNQUALIFIED NIGERIAN ENGINEERS

The Electricity Corporation of Nigeria has vacancies for Grade II and III Electrical and Mechanical Engineers on its Senior Staff at a level below that of professional degree status.

Candidates should have some technical training and knowledge of Mechanical Engineering or the Electrical Supply Industry but need not possess any recognised qualification. Suitable applicants may where necessary be sent on special training courses in the U.K. at the Corporation's expense before being returned to Nigeria for service in the Corporation's Undertakings.

It is believed there are a number of students who have failed in attempts to obtain professional qualifications in the U.K. and these students would be particularly suitable for this requirement.

Successful candidates will be posted in Nigeria as Engineers and Managers of small undertakings, Power Station Superintendents and Charge Engineers, or Mains Engineers on the Distribution Networks, according to their experience and the standard of their technical knowledge.

The salary attaching to these grades rises from £1,070 to £1,400 per annum and the posts are pensionable. The Entry point will depend mainly on previous experience, if any.

Return passages to Nigeria will be paid by the Corporation for the officer, his wife and up to two children.

Application forms may be obtained upon request to:

The Electricity Corporation of Nigeria
ADELPHI
John Adam Street
London, W.C.2

6565

SOUTH OF SCOTLAND ELECTRICITY BOARD

Nuclear Generating Station

APPPLICATIONS are invited for a super-annuable appointment as an ASSISTANT SHIFT CHARGE ENGINEER at the Board's Nuclear Generating Station which is being constructed at Hunterston, near Largs, Ayrshire.

The successful applicant will be responsible for delegated duties while on shift in the operation of both nuclear and conventional plant. The minimum technical standard will be the possession of a Higher National Certificate. Previous experience in power station operation is essential. A course will be given on the operation of nuclear reactors.

Salary N.J.B. Class M, Grade 8, £1,440/£1,610 per annum.

Applications, quoting reference No. G35/60, should be submitted on the standard form to the Secretary, South of Scotland Electricity Board, Inverlair Avenue, Glasgow, S.4, not later than Friday, 18th November, 1960.

6576

NORTH WESTERN ELECTRICITY BOARD

Fourth Assistant District Engineer (Drawing Office), Leigh District

Applicants should be familiar with the preparation of building drawings, electrical engineering diagrams and mains records. They should also have had a technical education and drawing office training. Possession of appropriate H.N.C. is desirable.

Salary scale £825/£940 p.a., Grade J.13. N.J.B. conditions.

Senior Demonstrator, Wigan District

Applicants must have had a good education with training in domestic science and should hold the E.A.W. Diploma. The person appointed will be required to give lectures and demonstrations on all types of domestic appliances, advise consumers on the choice of equipment, and must be capable of supervising staff.

Salary scale £700 × £25 to £775 p.a., Grade 2. N.J.C. conditions.

Applications on forms to be obtained from the Manager, No. 2 Sub-Area, North Western Electricity Board, 2, St. George's Road, Bolton, and returned to him by 14th November, 1960.

6546

CITY OF PLYMOUTH EDUCATION COMMITTEE

Plymouth and Devonport Technical College

REQUIRED as soon as possible:—

LABORATORY STEWARD GRADE I. To undertake the operation and servicing of the new Philips E.M.100 Electron Microscope and of X-ray diffraction equipment and to assist in the maintenance and servicing of nucleonic counting equipment and general laboratory duties. Applicants should have Higher National Certificate or Higher National Diploma in Electrical Engineering or Physics or equivalent qualifications or experience. Experience in high vacuum techniques and/or electronics an advantage. Previous experience on electron microscope not essential as training can be arranged. Facilities for further study provided.

Salary £11 15s. 7d. per week.

Particulars and forms of application from (and to be returned to) the Clerk to the Governors, Education Offices, Cobourg Street, Plymouth.

6613

Situations Vacant (continued)**SOUTHERN ELECTRICITY BOARD****Meter Engineer (Z.1275)**

Sub-Area Office of No. 2 (Newbury) Sub-Area. Salary N.J.B. Class M, Grade 5 (£1,795-£1,950 per annum). N.J.B. conditions of service.

The successful candidate will be responsible to the Sub-Area Engineer for the administration and control of the Sub-Area Meter Testing Station and to supervise all meter work throughout the Sub-Area. Candidates should be Corporate Members of the I.E.E. or possess equivalent qualifications. They must have a sound knowledge of all matters relating to meter engineering, including statutory requirements, and must be fully experienced in the operation of modern Class A Stations dealing with all types of A.C. and D.C. meters, demand indicators, instruments, time switches, instrument transformers and protective relays.

Assistant Engineers (Maintenance and Operation) (Z.1271)

(a) Reading District and (b) Oxford District of No. 2 (Newbury) Sub-Area. Salary in each case N.J.B. Class J, Grade 9 (£1,115-£1,245 per annum). N.J.B. conditions of service.

The duties of the posts will be to assist with the maintenance and operation of H.V. and L.V. distribution mains and substations with particular reference to the preparation of technical data relating to system operation. A technical training to H.N.C. standard and experience of similar work are required. A regular users' car allowance will be available.

Assistant Engineer (Maintenance and Operation) (Z.1272)

Oxford District of No. 2 (Newbury) Sub-Area. Salary N.J.B. Class J, Grade 9 (£1,115-£1,245 per annum). N.J.B. conditions of service.

The duties of the post will be to assist with the maintenance and operation of H.V. and L.V. distribution mains and substations and with minor construction work. A technical training to H.N.C. standard and experience of similar work are required. A regular users' car allowance will be available.

Applications for these appointments on forms obtainable from the Sub-Area Secretary, 7, Oxford Road, Newbury, Berks, and returned to him, quoting the appropriate "Z" number, not later than 14th November, 1960.

Transport Officer

Sub-Area Office of No. 4 (Bournemouth) Sub-Area. Salary N.J.C. Grade 5 (£1,020-£1,140 per annum). N.J.C. conditions of service.

The successful candidate will be responsible to the Sub-Area Secretary for the co-ordination, maintenance and administration of a mixed, decentralised fleet of, at present, approximately 425 vehicles.

Applicants must have had experience in the maintenance of road transport (preferably with a Public Utility in Great Britain) with particular reference to the control and maintenance of vehicles and mobile plant. A knowledge of road transport legislation and familiarity with modern vehicle costing methods, as well as administrative ability, are essential qualifications.

Applications on forms obtainable from the Sub-Area Secretary, 1, Priory Road, Bournemouth, and returned to him, quoting Z.1274, not later than 14th November, 1960.

Assistant Engineer (Planning)

Swindon District of No. 2 (Newbury) Sub-Area. Salary N.J.B. Class G, Grade 10 (£890-£1,015 per annum). N.J.B. conditions of service.

The duties of the post will be to assist the Planning Engineer in the preparation of schemes and estimates for extensions of and reinforcement to overhead and underground H.V. and L.V. networks, and to undertake standby duties if required. Applicants should possess suitable technical qualifications.

Applications on forms obtainable from the Sub-Area Secretary, 7, Oxford Road, Newbury, Berks, and returned to him, quoting Z.1234, not later than 14th November, 1960.

General Assistant Engineer

Southampton District of No. 4 (Bournemouth) Sub-Area. Salary N.J.B. Class H, Grade 11 (£890-£1,015 per annum). N.J.B. conditions of service.

The successful candidate will be required to give general assistance in the preparation of

schemes and estimates for extensions of and reinforcement to overhead and underground H.V. and L.V. networks. Applicants should have had sound experience in electricity supply distribution, and the possession of suitable technical qualifications would be an advantage. The successful candidate will be required to carry out standby duties if and when called upon to do so.

Applications on forms obtainable from the Sub-Area Secretary, 1, Priory Road, Bournemouth, and returned to him, quoting Z.1273, not later than 14th November, 1960.

Agricultural Representative

Swindon District of No. 2 (Newbury) Sub-Area. Salary N.J.C. Grade 3 (£780-£880 per annum). N.J.C. conditions of service.

Applicants should have a sound knowledge of the applications of electricity in agriculture and horticulture, be capable of preparing estimates, conducting negotiations and obtaining new business. Ability to give talks to agricultural organisations will be an advantage.

Applications on forms obtainable from the Sub-Area Secretary, 7, Oxford Road, Newbury, Berks, and returned to him, quoting Z.1259, not later than 14th November, 1960.

The successful candidates for the above appointments will be required to contribute to the Electricity Supply (Staff) Superannuation Scheme, if eligible.

6610

CENTRAL ELECTRICITY GENERATING BOARD**Midlands Division****Assistant Engineer (Divisional Headquarters)**

FOURTH ASSISTANT ENGINEER required in the Electrical Department at Divisional Headquarters.

N.J.B. Agreement conditions. Superannuable appointment, salary within Schedule B, Class BX, either Grade 9, 10 or 11, according to qualifications and experience. The salary ranges are as follows:—

Grade 9, £1,005-£1,325 per annum; Grade 10, £935-£1,245 per annum; Grade 11, £855-£1,165 per annum.

Candidates should possess a Higher National Certificate in Electrical Engineering or an equivalent qualification and should have had some experience on equipment associated with E.H.V. transmission equipment, e.g. switchgear, transformers or overhead line. Previous applicants for this position will be re-considered and need not re-apply.

Apply quoting vacancy number 299/60MD, on form AE6, available from the Establishments Officer, 53, Wake Green Road, Moseley, Birmingham, 13, to reach him not later than 14th November, 1960.

6603

DECCA RADAR**Overseas Diesel Generating Installations**

AN ELECTRICAL ENGINEER is required to Supervise the installation and commissioning of a number of power houses to be equipped with high speed diesel generating sets in the range 33-250 kVA operating in groups of up to 7 of the larger machines.

Candidates should be familiar with the design considerations arising from arrangement of multiple units in paralleled installation, operation and maintenance. They should also have good working knowledge of diesel engine practice.

Prior to going abroad the successful applicant will spend some months in training on the equipment at the manufacturers' works and in advising on design of the installations.

Applicants should be single or be prepared to be away from the U.K. unaccompanied for periods up to two years at a time. Generous U.K. salary and local allowances paid.

Apply: Personnel Officer, Decca Radar Limited**Shannon Corner, New Malden, Surrey, quoting HID/19/1.**

6568

CENTRAL ELECTRICITY GENERATING BOARD**South Eastern Division****Croydon "A" and "B" Generating Stations**

APPPLICATIONS are invited for the position of **SECOND ASSISTANT CHEMIST**, Croydon "A" and "B" Generating Stations (Vacancy No. 223/60R).

Candidates should be familiar with the methods of sampling and analysis of coal, water and oil, together with the interpretation and application of analytical results in respect of power plant operation. Preference will be given to candidates having previous power station experience with a minimum qualification of H.N.C. (Chemistry).

Salary in accordance with N.J.B. Class K, Grade 11, £1,090 to £1,215 per annum, including London allowance.

Applications giving age, details of qualifications, experience, etc., and quoting vacancy number, should be sent to the Station Superintendent, Croydon "B" Power Station, Beddington Farm Road, Croydon, Surrey, to arrive by 16th November, 1960.

W. H. DUNKLEY,
Divisional Controller.

6596

CENTRAL ELECTRICITY GENERATING BOARD**South Eastern Division****Kingston Power Station****Electrical Maintenance Engineer**
(Vacancy No. 215/60R)

THE successful candidate will be responsible for the organisation and efficient working of the electrical repairs and maintenance department in a modern power station. He should be able to interest and lead his staff, to think for himself and have abundant energy and initiative. Experience of power station plant and possession of H.N.C. in Electrical Engineering are desirable, and an understanding of budgetary control would be advantageous.

Salary N.J.B. Class G, Grade 6, £1,240 to £1,375 per annum, including London allowance.

Applications giving age, details of experience, qualifications, etc., and quoting vacancy number, should be sent to the Station Superintendent, Kingston Power Station, Down Hall Road, Kingston-upon-Thames, Surrey, to arrive by 11th November, 1960.

W. H. DUNKLEY,
Divisional Controller.

6597

MIDLANDS ELECTRICITY BOARD

APPPLICATIONS are invited for the following superannuable posts:—

Central Gloucestershire Sub-Area

THIRD ASSISTANT ENGINEERS
(Control) (Two) (Headquarters).

The successful applicants will be required to take full shift responsibilities for all functions associated with high-voltage system control. Applicants should have had sound technical training together with experience of switching operations and maintenance work on H.V. distribution equipment. Technical qualifications desirable. Salary £1,115/£1,245 per annum (N.J.B. Grade K.10) plus 10% shift enhancement when on shift duty.

Apply by letter, within 14 days, stating age, experience, qualifications, present position and salary to Mr. S. Raybould, Sub-Area Manager, Midlands Electricity Board, Eastern Avenue, Gloucester.

Wolverhampton and District Sub-Area

THIRD ASSISTANT DISTRICT
ENGINEER (Walsall).

Applicants should have had experience in the construction and maintenance of high and medium voltage distribution systems. Technical qualifications desirable. Salary £965/£1,090 per annum (N.J.B. Grade G.9).

GENERAL ASSISTANT DISTRICT
ENGINEER (Walsall).

Applicants should have had experience in the electricity supply industry. Technical qualifications desirable. Salary within the ranges £715/£805, £765/£870 or £825/£940 per annum (N.J.B. Grades G.13, 12 or 11) according to qualifications and experience.

GENERAL ASSISTANT DISTRICT
ENGINEER (Wolverhampton).

Applicants should have had experience in the electricity supply industry. Technical qualifications desirable. Salary within the ranges £765/£870, £825/£940 or £890/£1,015 per annum (N.J.B. Grades J.14, 13 or 12) according to qualifications and experience.

Apply by letter stating age, qualifications, experience, present position and salary to Mr. D. Holt, Sub-Area Manager, Midlands Electricity Board, 83, Darlington Street, Wolverhampton.

Worcester and District Sub-Area

FIRST ASSISTANT DISTRICT
ENGINEER (Evesham).

Experience necessary in all branches of distribution work including construction, maintenance and operation of high and low-voltage underground and overhead systems and substations. Technical qualifications desirable. Salary £1,190/£1,325 per annum (N.J.B. Grade F.5).

Apply by letter, within 14 days, stating age, experience, present position and salary to Mr. J. Johnston, District Manager, Midlands Electricity Board, 64, High Street, Evesham.

WAYLEAVE OFFICER/SURVEYOR
(Headquarters).

Duties include surveying, profiling, plotting of routes and negotiation and preparation of wayleave agreements and consents for overhead lines. Salary £780/£880 per annum (N.J.C. Grade 3).

Apply by letter, within 14 days, stating age, experience, present position and salary to Mr. R. Mallet, Sub-Area Manager, Midlands Electricity Board, P.O. Box No. 52, Blackpole Road, Worcester.

F. W. CATER,
Secretary. 6571

ADMIRALTY

Degaussing Officers

10 POSTS for men at least 30 and under 55 on 1.9.60 who have had practical training in electrical engineering work and followed regular courses of study in electrical theory. Sound understanding of elementary theory of magnetism and intimate knowledge of ships essential. Experience of degaussing work and service in R.N. or Merchant Navy an advantage.

Appointments for period of at least 5 years for service in U.K. or abroad as required.

Salary £795/£935. Promotion prospects.

Write Civil Service Commission, 17, North Audley Street, London, W.1, for application form, quoting S/5215/60. Closing date 5th December, 1960. 6570

NEW ZEALAND
MINISTRY OF WORKS

The New Zealand Government Ministry of Works invites applications for Permanent Staff appointments. Positions available are:—

CIVIL ENGINEERS

Qualifications: Corporate Membership of the Institution of Civil Engineers, London. Commencing salaries from £985-£1,700 per annum.

ASSISTANT CIVIL ENGINEERS

Qualifications: A University Degree in Civil Engineering which gives exemption from Final Parts I and II of the A.M.I.C.E. examination; or other qualifications exempting from Parts I and II of A.M.I.C.E. plus at least 5 years' appropriate experience. Commencing salaries from £900-£1,120 per annum.

MECHANICAL AND
ELECTRICAL ENGINEERS
(AND ASSISTANTS)

Qualifications: Corporate Membership of the Institutions of Mechanical or Electrical Engineers, London, or for Assistants a University Degree in Mechanical or Electrical Engineering or Graduate Membership of the above Institutions. Commencing salaries for Engineers £985-£1,700 and for Assistants up to £1,120 per annum.

BUILDING SERVICES
ENGINEERS (AND ASSISTANTS)

Qualifications: Corporate Membership of the Institution of Mechanical Engineers or of the Institution of Heating and Ventilating Engineers, London, or for Assistants a University Degree in Mechanical Engineering or Graduate Membership of the above Institutions. Commencing salaries for Engineers, depending on experience, £985-£1,700, and for Assistants up to £1,120 per annum.

Subject to completion of a Bond to remain in the Service for 3 years, successful applicants will be assisted with expenses incurred in travelling to New Zealand. A superannuation scheme is available and there are generous annual and sick leave privileges.

Enquiries, mentioning this publication, quoting reference number B11/30/23, and indicating the position sought, should be addressed to the High Commissioner for New Zealand, 415, Strand, London, W.C.2. Full details of housing available, fares payable, career prospects, type of work, terms of contract, local conditions and application forms will then be supplied.

6542

MERSEYSIDE AND NORTH WALES
ELECTRICITY BOARD

No. 4 Sub-Area

DEMONSTRATOR required in the Wrexham District of the Board's No. 4 Sub-Area. Salary within the range £600/£700 per annum (N.J.C. Grade 1).

Candidates should have a good knowledge of electrical appliances, should be experienced demonstrators and be competent to give demonstrations of cooking, laundering and housecraft subjects. The possession of a recognised Diploma in Domestic Science or other approved certificate desirable.

Possession of a valid motor vehicle driving licence would be an advantage.

Appointment subject to medical examination. Pension scheme.

Standard application forms should be submitted to the Manager, No. 4 Sub-Area, Rhosyllen, Nr. Wrexham, or from any District Office.

Closing date, 14th November, 1960.

Applicants in respect of previous advertisement need not re-apply. 6608

SOUTH EASTERN ELECTRICITY BOARD

FIRST ASSISTANT DISTRICT ENGINEER, Kingston District.

Salary under N.J.B. Class G, Grade 5, £1,275-£1,410 p.a. with progression to Grade 4 (maximum salary £1,500), subject to satisfactory service, plus London weighting. Superannuable. Reclassification is probable from April, 1961. Consideration will be given to a car allowance and assistance with house purchase. The successful applicant will be required to assist the District Engineer in all the work of a distribution department, and must have had a wide experience of all aspects of distribution engineering and, in particular, planning, construction, and the control of staff. Applicants should be suitably qualified and preferably Corporate Members of the I.E.E.

Applications, quoting ER and naming 2 referees, on forms from District Manager, SEEB, 22, Claremont Road, Surbiton, Surrey, by 16th November, 1960.

GEORGE WRAY,
Secretary. 6611

Situations Vacant (continued)**CENTRAL ELECTRICITY
GENERATING BOARD****East Midlands Division****ASSISTANT CHEMIST,
DIVISIONAL LABORATORY**
(Vacancy No. 246/60).

Applications are invited for the position of Assistant Chemist in the Divisional Laboratory at North Wilford Power Station, Queens Drive, Nottingham.

Candidates should be capable of initiating and leading investigations into one or more of the following topics: air pollution, river pollution, industrial water treatment, analytical method development, and should have a sound knowledge of inorganic analysis.

Candidates should hold a degree or equivalent professional qualification. Previous power station experience is advantageous although not essential.

Salary will be in accordance with Class BX, Grade 8 (£1,105 - £1,410 per annum) of the National Joint Board Agreement, and the position will be pensionable within the terms and conditions of the Electricity Supply (Staff) Superannuation Scheme.

**THIRD ASSISTANT ENGINEER,
TECHNICAL DEPARTMENT,
DIVISIONAL HEADQUARTERS**
(Vacancy No. 251/60).

Applications are invited for the position of Third Assistant Engineer in the Technical Department at Divisional Headquarters, Nottingham.

The minimum technical qualification desired is the Higher National Certificate in Electrical Engineering, and preference will be given to candidates who have completed a recognised postgraduate apprenticeship.

Experience in the commissioning of high-voltage switchgear and protective gear is essential. Experience in the associated contract engineering work is desirable.

Salary will be in accordance with Class BX, Grade 6 (£1,285 - £1,610 per annum) of the National Joint Board Agreement, and the position will be pensionable within the terms and conditions of the Electricity Supply (Staff) Superannuation Scheme.

Applications should be submitted on the official form AE6/ACT, which may be obtained from the Divisional Establishments Officer, P.O. Box 25, Barker Gate, Nottingham, and should be returned to him not later than 19th November, 1960.

O. S. WOODS,
Divisional Controller.

27th October, 1960.

6573

AIR MINISTRY

ASSISTANT MECHANICAL AND ELECTRICAL ENGINEERS required for design, construction and maintenance of installations on airfields, radar stations, missile bases, workshops and maintenance units for the R.A.F. at home and overseas as well as certain Civil Airports.

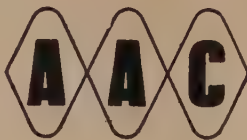
Salary £805 at 25 to £1,095 at 34 or over, thereafter rising to max. £1,260 with increase for London and slight decrease for country districts. Appointments long term with promotion and pension prospects. 5-day week with 4 weeks 2 days leave a year initially. Special allowances payable in addition to salary during overseas service.

Minimum qualifications and experience:—

- (i) (a) University degree or equivalent diploma in electrical and/or mechanical engineering with at least 2 years' apprenticeship; or
- (b) Graduate or Corporate Member of I.E.E. with at least 3 years' apprenticeship; or
- (c) Graduate or Corporate Member of I.Mech.E., appreciable electrical engineering experience, with at least 3 years' apprenticeship; and
- (ii) have been employed for minimum of 2 years with well-established engineering concern and gained wide experience in both electrical and mechanical engineering practice.

Applicants must be natural-born British subjects between the ages of 25 and 45. Forms from Ministry of Labour, Technical and Scientific Register (K), 26, King Street, London, S.W.1, quoting D.158/OA.

248

**RHOKANA CORPORATION LIMITED**

Northern Rhodesia

SECTIONAL ENGINEER—ELECTRICAL

APPLICATIONS are invited from suitably qualified candidates for a position as Sectional Engineer—Electrical with Rhokana Corporation Limited in Northern Rhodesia.

The successful applicant should be not less than 25 years of age and have had general experience in testing, commissioning and maintaining of electronic and light current devices and control circuits associated with the control of processes as applied to heavy industrial and mining requirements.

He must also be capable of developing, as and when the need arises, new electronic and light current control devices with a minimum of supervision, and be capable of applying and commissioning such developments for use in heavy industrial and mining work.

Salary will be commensurate with qualifications and experience, but in any event will not be less than £141 1s. 6d. per month, plus a variable cost-of-living allowance which at present is approximately £5 per month.

Conditions of employment include married/single accommodation at sub-economic rental, medical scheme, pension and life assurance schemes and participation in the metal bonus scheme, which at present is approximately 30% of annual earnings.

Applications in writing, stating qualifications, experience, age and marital status, should be addressed by air mail to:—

The Personnel Manager

RHOKANA CORPORATION LIMITED

P.O. Box 2000, Kitwe, Northern Rhodesia

6541

THE BOWATER ORGANISATION

APPLICATIONS are invited from suitably qualified men under the age of 40 years for the positions of **SHIFT ELECTRICAL FOREMEN**. Successful applicants will be responsible for the maintenance of electrical equipment covering power generation, distribution and utilisation in a large paper manufacturing plant.

These are permanent staff appointments necessitating three-shift working. A contributory superannuation fund including provisions for life assurance and widows' pensions is operated by the company.

Applicants are invited to write in confidence giving details of age, training, qualifications and experience to the Chief Engineer, Bowaters United Kingdom Pulp and Paper Mills Limited, Thames Division, Northfleet, Kent.

6579

THE UNIVERSITY OF LEEDS**Department of Electrical Engineering**

APPLICATIONS are invited for appointment to two **LECTURESHIPS** in the Department of Electrical Engineering. Candidates should have good academic qualifications and industrial or other experience in one of the following fields: electric power engineering, electrical machines, electrical measurements, control engineering, or microwave engineering.

Salary on the scale £1,050 × £50 to £1,400 × £75 to £1,850 (efficiency bar at £1,550), according to age, qualifications and experience.

Applications (three copies), together with the names of three referees, should reach the Registrar, The University, Leeds, 2 (from whom further particulars may be obtained) not later than 2nd December, 1960.

6572

COMMISSIONING

AND

OPERATION

OF

NUCLEAR POWER STATIONS

A number of responsible new appointments have been created in a team engaged on the commissioning and early operation of Nuclear Power Stations.

Candidates should be either Associate Members of a major professional institution or hold qualifications leading to Associate Membership. Some experience in the operation of conventional plant would be desirable. Full training in the operation of Nuclear Power Stations will be arranged for the successful candidates.

Please write box number ER.1046, LPE Romano House, 399/401 Strand, London, W.C.2.

6540

CENTRAL ELECTRICITY
GENERATING BOARD

South Wales Division

APPLICATIONS are invited for the following superannuable N.J.B. Schedule "A" appointments:—

USKMOUTH "B" POWER STATION,
WEST NASH, Nr. NEWPORT, MON.
SECOND ASSISTANT
STATION CHEMIST
(Vacancy No. 292/ER/60).
Salary Class K, Grade 10, Scale 9, £1,115-
£1,245 per annum.

Applicants should possess a Degree in Chemistry or equivalent; experience in water treatment, coal and oil testing and corrosion problems desirable.

USKMOUTH "A" POWER STATION,
WEST NASH, Nr. NEWPORT, MON.
THIRD ASSISTANT
STATION CHEMIST
(Vacancy No. 293/ER/60).
Salary Class K, Grade 12, Scale 7, £965-
£1,090 per annum.

Applicants should possess H.N.C. (Chemistry) or its equivalent and should have had experience in a modern power station.

ASSISTANT MAINTENANCE
ENGINEER (M)
(Re-Advertisement)
(Vacancy No. 294/ER/60).
Salary Class K, Grade 8, Scale 11, £1,275-
£1,410 per annum.

Applicants should possess H.N.C. or equivalent qualifications, and have had operating experience in a modern power station.

Previous applicants need not re-apply.

ASSISTANT SHIFT CHARGE
ENGINEER
(Vacancy No. 295/ER/60).
Salary Class K, Grade 8, Scale 11, £1,275-
£1,410 per annum, plus 10% shift enhancement.

Applicants should possess H.N.C. or equivalent qualifications, and have had operating experience in a modern power station.

Special application forms obtainable from Secretary, South Wales Division, Central Electricity Generating Board, Twyn-y-fedwen Road, Gabalfa, Cardiff, to be returned by 18th November, 1960. 6599

YORKSHIRE ELECTRICITY BOARD

Electronic Data Processing

APPLICATIONS are invited for superannuable appointments to the staff of the Chief Accountant to establish and operate in Leeds a large centralised electronic data processing system employing an English Electric KDP.10 computer with associated equipment.

The appointments are:—

- (1) ASSISTANT CHIEF ACCOUNTANT (N.J.M. Grade C.7, £2,595/£2,815).
- (2) ASSISTANT ACCOUNTANT (Planning) (N.J.M. Grade C.4, £1,965/£2,170).
- (3) ASSISTANT ACCOUNTANT (Operation) (N.J.M. Grade C.3, £1,765/£1,965).

The duties of post (1) will be to take charge of the complete project, covering both planning and operation, and applicants should have had considerable experience of large-scale administrative reorganisation. Possession of a recognised accountancy or academic qualification and experience of electronic data processing will be advantageous.

The duties of post (2) will be to supervise the systems analysis and programming work and to organise the takeover of work from existing punched-card systems to the computer system.

The duties of post (3) will be to operate the system, including computer, magnetic tape stations, off-line equipment, punched-card machinery and administrative arrangements. Applicants should have had sound mathematical, accountancy or other related experience, but a knowledge of computer techniques is not essential, as appropriate training will be given.

Applications, quoting ER7, should include the names of two referees and be sent to the Secretary, Yorkshire Electricity Board, Wetherby Road, Scarcroft, Leeds, to reach him not later than fourteen days after the appearance of this advertisement. 6558



M.K. ELECTRIC LIMITED

have the following vacancies in their Technical Drawing Office:—

DESIGNERS—experienced in the design of small Electrical/Mechanical products for large quantity manufacture.

DRAUGHTSMEN—with routine Drawing Office experience and preferably in connection with small electrical products — preparing standard drawings, data sheets, etc.

Excellent working conditions in a new drawing office. Five-day week of 37½ hours. Holiday arrangements honoured and attractive salaries offered according to experience.

Applications treated in strict confidence if addressed to:—

Technical Manager, M.K. ELECTRIC LTD.
Shrubbery Road, Edmonton, London, N.9

6630

UGANDA ELECTRICITY BOARD

THE Board requires ASSISTANT ELECTRICAL ENGINEERS to participate in the interesting work of electrical development in the Protectorate.

Uganda has a very pleasant climate and income tax is lower than in the United Kingdom. Passages for employee and family, partly furnished accommodation, medical and dental treatment all free. Five days' overseas leave for every completed month of service in East Africa, plus local leave. Normal tour of duty 24-36 months.

Applicants should be Corporate Members of the Institution of Electrical Engineers or should have technical qualifications leading to that status.

Some experience in the construction and/or operation and maintenance of an electricity supply network, including overhead lines and substations with voltages up to 33 kV is essential. Experience at higher voltages is desirable.

Commencing salary depending upon qualifications and experience within the scale £1,265 × £35 to £1,580 per annum. In addition a monthly gratuity of 30% of salary will be paid.

SECONDMENT. Persons serving in the United Kingdom Electricity Industry may be seconded to Uganda for periods of up to two years without loss of pension or other rights with the approval of their employing authority. Annual leave entitlement for seconded personnel is six weeks.

Application forms and further information on Uganda and the Uganda Electricity Board may be obtained from the London Representative, Uganda Electricity Board, Uganda House, Trafalgar Square, London, W.C.2, to whom completed forms should be returned not later than 25th November, 1960.

E. H. WILSON,
Secretary. 6609

BIRMINGHAM REGIONAL
HOSPITAL BOARD

Engineering Assistants

SALARY £600-£1,070 per annum. Interesting work in Regional Engineer's Department on design and installation of mechanical and electrical services for new hospitals and alterations to existing. Previous hospital experience desirable but not essential.

Apply (quoting Eng.11), naming three referees, to Secretary, 10, Augustus Road, Edgbaston, Birmingham, 15 (from whom further details can be obtained) by 10th December, 1960. 6601

LONDON ELECTRICITY BOARD

Senior Draughtsman

APPLICATIONS are invited for the above position in the Board's South Western District, 204, Lavender Hill, London, S.W.11.

Candidates should have had a good general and technical education, possess the Ordinary National Certificate in Building or its equivalent, and be capable of supervising engineering draughtsmen and other drawing office staff. They must be capable of preparing drawings and structural calculations for building and reinforced concrete work mainly associated with the construction of transformer chambers within new and existing buildings.

Pending determination as to the grading of the post within Schedule A of the National Joint Board Agreement, the salary will be in the provisional range £940 per annum rising to £1,065 per annum inclusive of London allowance.

Application form obtainable from the Personnel Officer, 46, New Broad Street, London, E.C.2, to be returned completed within 14 days of the publication date of this notice. Please quote ref. PER/V/3131/R. 6619

ELECTRICAL DEVELOPMENT
ENGINEER

required by

F. PERKINS LTD.

DIESEL ENGINE MANUFACTURERS

APPLICANTS should be of H.N.C. standard or G.I.E.E., and should have experience in the design, development and use of special-purpose instruments. A good general knowledge of internal combustion engines is desirable.

The main functions will be the development of electronic and electrical instruments for use on high-speed diesel engines.

We offer good salary, 3 weeks' holiday and modern welfare facilities.

Applications should be made in writing to Staff Officer, Eastfield Factory, Peterborough, giving details of age, experience, etc., and salary expected.

6543

Situations Vacant (continued)**SOUTH OF SCOTLAND
ELECTRICITY BOARD****Lanarkshire Area**

- (1) **Third Assistant District Engineer, Motherwell District.**
 (2) **Third Assistant District Engineer, Rutherglen District.**
 (3) **General Assistant District Engineer, Rutherglen District.**

APPPLICATIONS are invited for the above appointments. Applicants should have had a sound engineering and technical training and preferably be Graduates of the Institution of Electrical Engineers or hold equivalent qualifications.

The salary and conditions of service will be in accordance with the National Joint Board Agreement. The posts will be superannuable.

Applicants should have had some experience in the maintenance and operation of H.V. and L.V. overhead and underground networks and be conversant with load flow diagrams and voltage drop and short circuit calculations.

It is a condition of these appointments that the successful candidates take standby duty in accordance with the above agreement and reside within a reasonable distance of their respective district offices.

Present classification and gradings are as follows:—

Appointments 1 and 2, G.9 (Scale 7), salary £965/£1,090.

Appointment 3, G.11 (Scale 5), salary £825/£940.

Application forms which may be obtained from the undersigned, should be returned to this office within 14 days of the date of this advertisement.

R. J. RENNIE,
Manager.
6612

**SOUTH OF SCOTLAND
ELECTRICITY BOARD****Edinburgh and Borders Area**

**Third Assistant District Engineer,
Borders District**

Salary N.J.B. Schedule A, Class F,
Grade 9, £890/£1,015

APPPLICATIONS are invited for the appointment of a **THIRD ASSISTANT DISTRICT ENGINEER** in the Borders District, based on Berwick-upon-Tweed.

Conditions of service will be in accordance with the National Joint Board Agreement for the Electricity Supply Industry, and the successful candidate will, subject to satisfactory evidence of health, require to become a contributor to the Board's superannuation scheme.

Applicants should preferably possess the Higher National Certificate in Electrical Engineering or equivalent qualifications, and have experience in the planning, construction, operation and maintenance of high-voltage and low-voltage overhead and underground systems, and associated substation plant and equipment.

The successful applicant will require to reside within a reasonable distance of District Headquarters.

Applications, on the standard form, obtainable from the undersigned, should be submitted not later than 18th November, 1960.

C. H. A. COLLYNS,
Manager.
52, Melville Street,
Edinburgh, 3. 6569

G. W. B.

SALES MANAGER

THE Control Gear Division of G.W.B. Furnaces Limited will appoint a man with experience in all types of medium-voltage electrical drives in medium and heavy industries. Good commercial and sales background required.

Write in confidence, giving details of experience, qualifications and salary required, to:—

Manager

G. W. B. FURNACES LTD.

(Control Gear Division)

P.O. Box No. 4

Dibdale Works, Dudley, Worcs.

6556

**UNITED KINGDOM AND OVERSEAS
ELECTRICAL CONTRACTING
COMPANY**

offer tremendous scope and opportunities resulting from continued expansion to the following personnel. Two-year tours with home leave to U.K. Accommodation provided, local allowances and excellent salaries. Permanent posts.

TELECOMMUNICATIONS ENGINEER for site survey of existing telecommunications network in Iran, including automatic telephone exchanges, underground and overhead distribution, trunk and junction routes, for the purpose of preparing complete and detailed records of the network to British Post Office standards.

Applicants must have a sound basic knowledge of multicore telephone cable installations, methods of jointing, etc., overhead telephone line practice and accurate and detailed measurement and mapping of line plant and installations.

Previous experience of the preparation of card index plant and fault records to British Post Office standards and/or H.F. and V.H.F. radio installations would be an advantage.

ELECTRICAL ENGINEER for consultants' office in Teheran. Must have had at least three years' experience as a senior engineer in the design of installations for the oil or chemical industries. Corporate Membership of the I.E.E. would be an advantage.

All applicants must give full particulars of past and present employers and experience, together with qualifications.

**N. G. BAILEY AND COMPANY
LIMITED**

Heathcote, Ilkley, Yorks.

6547

**SENIOR
ELECTRICAL DESIGN
DEVELOPMENT ENGINEER**

A MAN of live personality required by a leading manufacturer of rotating electrical equipment to implement the expansion of the Development Department of a company situated in the Midlands.

Applicants will be judged on creative ability, leadership and capacity to progress in a live organisation.

Some years' design experience on A.C./D.C. rotating machines is required backed up by a professional qualification or university degree; a minimum attainment of H.N.C. may be acceptable.

This appointment carries a high commencing salary and opportunity for advancement.

A contributory pension scheme is in operation.

Applications, which will be treated in the strictest confidence, should contain full details of career and be sent to—
Box 331.

**CITY OF BIRMINGHAM
EDUCATION COMMITTEE**

Garretts Green Technical College,
Garretts Green Lane, Birmingham, 33

Principal:

B. C. Whitehouse, B.Sc., A.R.I.C., Dip.Ed.

Department of Electrical Engineering

APPPLICATIONS are invited for the **HEADSHIP (Grade II)** of this Department. Courses offered include O.N.C. Electrical Engineering and G.C.L.L. courses for Electrical Technicians, Electrical Installation Work, Radio and Television Servicing and Telecommunications Technicians.

Salary scale £1,600 × £50 to £1,800. Application form and further particulars may be obtained from the Principal (foolscap s.a.e.), to whom completed forms must be returned not later than 30th November, 1960.

E. L. RUSSELL,

Chief Education Officer.

6625

**CITY OF LIVERPOOL
EDUCATION COMMITTEE**

College of Technology, Byrom Street,
Liverpool, 3

Principal: S. A. J. Parsons, B.Sc.(Econ.),
M.I.Mech.E., M.I.Prod.E., M.B.I.M.

Department of Electrical Engineering

APPPLICATIONS are invited from suitably qualified persons for the appointment of two **SENIOR LECTURERS IN ELECTRICAL ENGINEERING (full-time)**.

(i) for **HEAVY CURRENT**, and

(ii) for **LIGHT CURRENT** work.

Salary £1,550 × £50 to £1,750 per annum (1959 Burnham Technical Report). Increments within the scale may be added to the commencing salary for approved industrial or professional experience or research work of an equivalent standard.

Applicants should have experience for (i) on electrical machines and electricity supply, and for (ii) in the field of electrical measurements and electronic engineering. An honours degree in electrical engineering is essential; an appropriate professional qualification is desirable, together with industrial and/or research experience. Teaching experience is desirable. Persons appointed would be encouraged to undertake research and would be expected to organise post-graduate courses.

Application forms (returnable by 18th November, 1960) and further particulars from H. S. Magnay, M.A., Director of Education, 14, Sir Thomas Street, Liverpool, 1. Please state which post is being applied for.

THOMAS ALKER,

Town Clerk and Clerk to the
Local Education Authority.

(J.6474)

6559

**CENTRAL ELECTRICITY
GENERATING BOARD**

North Eastern and Yorkshire Region

**Appointment of Fourth Assistant Engineer
(Clerk of Works), Generation Department
North Eastern Division**

APPPLICATIONS are invited for the appointment of a **FOURTH ASSISTANT ENGINEER (Clerk of Works)** in the Generation Department, Newcastle upon Tyne.

Applicants should have had a wide experience in the supervision of building and civil engineering trades, the interpretation of drawings and contract documents and be fully conversant with modern buildings and construction techniques. Duties will include the carrying out of surveys, setting out of works and agreeing site measurements.

Candidates should possess, as a minimum, an Ordinary National or City and Guilds Certificate in Building, or have equivalent qualifications.

The salary for the appointment, which is superannuable, will be in accordance with the National Joint Board Agreement, Grade 9, Schedule B (£1,005-£1,245 per annum) and will commence at a point commensurate with qualifications and experience.

Forms of application may be obtained from the Assistant Regional Secretary (Personnel), Central Electricity Generating Board, North Eastern and Yorkshire Region, 1, Whitehall Road, Leeds, 1, to whom they should be returned to arrive not later than the 15th November, 1960. 6602

YORKSHIRE ELECTRICITY BOARD

No. 3 (Sheffield) Sub-Area

THIRD ASSISTANT ENGINEER (Distribution Design).

Applicants should hold qualifications leading to Associate Membership of the Institution of Electrical Engineers and have had a sound practical training with subsequent experience in electricity supply or with an electrical manufacturer.

Salary N.J.C. Class N, Grade 10 (Scale 12), £1,350/£1,500 per annum.

Applications together with the names of two referees, should be returned to the Manager, Yorkshire Electricity Board, No. 3 (Sheffield) Sub-Area, Commercial Street, Sheffield, not later than 18th November, 1960. 6605

SOUTH WALES ELECTRICITY BOARD**Senior Showroom Assistant**

Applications are invited for the position of SENIOR SHOWROOM ASSISTANT in our Showrooms at M.L. Street, Pontypridd.

Applicants must have experience in the use and application of domestic electrical apparatus and in modern selling techniques and display.

Salary N.J.C. Grade 2 (£700/£775). Superannuation, sick pay and holiday schemes.

Applications, stating age, present position present salary, qualifications and experience should be addressed to C. L. Townsend, Assoc. I.E.E., Manager, Cardiff and East Central Area, 445/447, Cowbridge Road East, Cardiff, so as to arrive not later than 19th November, 1960. Please quote reference 149/60/ER, endorsing envelopes "Senior Showroom Assistant."

Previous applicants need not re-apply as their applications are still under consideration.

Assistant Engineer

Applications are invited for the position of ASSISTANT ENGINEER in the South Cardiganshire District (Cardigan) in the West Wales Area of the Board.

Salary N.J.B. Class D, Grade 9, Scale 4 (£765/£870).

Applications stating age, present position, present salary, qualifications and experience should be addressed to W. E. Richardson, A.M.I.E.E., Manager, West Wales Area, South Beach Pavilion, Tenby, Pembrokeshire, to reach him not later than 19th November, 1960. Please quote reference 201/60/ER, endorsing envelopes "Assistant Engineer."

R. G. WILLIAMS,

Secretary. 6578

BEATTIES, WOLVERHAMPTON**Chief Electrician**

APPLICATIONS are invited from experienced men between 30 and 40 years of age, who hold City and Guilds "C" Certificate, and are capable of organising maintenance staff and hired labour, advising on and supervising rewiring of premises, and recording layouts of lighting and power installations.

Routine duties will include systematic testing of circuits and maintenance of over 4,000 light fittings, keeping of consumption and other records, pricing of schemes, ordering materials, report writing, and advising on new materials and on all matters relating to the electrical installations generally.

The salary offered is £850 to £1,000 depending on experience and ability, and this could increase as this department store expands.

The post offers an excellent opportunity to an ambitious, methodical and conscientious man with the required technical knowledge and organising ability.

Other benefits include superannuation scheme, profit sharing, three weeks and five days' annual holiday plus customary holidays, and discount on store shopping.

Please send for application form to the Staff Controller, Beatties of Wolverhampton. 6575

TO**ELECTRICAL ENGINEERS
INTERESTED IN SALES WORK**

We offer a career as a Sales Engineer

A VACANCY exists in our organisation for an engineer who is keen to develop a career in a section dealing with inside sales and design work. This post offers you the opportunity to obtain extensive experience in the following fields:-

METAL RECTIFIERS
TRANSFORMERS
D.C. POWER SUPPLY AND
BATTERY CHARGING EQUIPMENT

If you satisfy the following requirements why not write to us?

Sound engineering background.

Technical qualifications to above H.N.C. level.

Experience in a design or sales section.

A comprehensive training and a salary commensurate with ability will be given to the successful applicant.

Write without delay, to

ELECTRO-AUTOMAT LTD.

Swinton, nr. Manchester

giving full details of your career. Please quote reference SE/ER/MJP. 6615

DESIGNER

APPLICATIONS are invited from Engineers with qualifications of at least H.N.C., preferably in Mechanical Engineering, for design and development work on M.V. circuit breakers and fuse switchgear. Creative initiative and aptitude for design work is important, switchgear experience desirable.

Good salary and prospects with a company near the South Devon coast. There is a non-contributory pension scheme, and housing accommodation will be available if required.

Apply giving full details of qualifications and experience to the Chief Designer, Ottermill Switchgear Ltd., Ottery St. Mary, Devon.

6626

**CENTRAL ELECTRICITY
GENERATING BOARD****South Western Division**

STATION SHIFT CONTROL ENGINEER required at Bath Power Station. (Vacancy No. ER/AV/153/60.)

Superannuation scheme. Salary N.J.B. Class D, Grade 10, Scale 3, £715-£805 per annum, plus 10% shift allowance.

ASSISTANT SHIFT CHARGE ENGINEER required at Plymouth A Power Station. (Vacancy No. ER/AV/154/60.)

Superannuation scheme. Salary N.J.B. Class F, Grade 9, Scale 6, £890-£1,015 per annum, plus 10% shift allowance.

Applicants should possess good technical qualifications and have had training and experience in the control and operation of modern steam generating plant and main switchgear.

Applications on Form A.E.6/ACT, obtainable from the Divisional Secretary, 26, Oakfield Road, Clifton, Bristol, 8, should be completed and returned by 14th November, 1960. 6604

G. W. B.

SALES ENGINEER

for London area. Experience in motor control gear required. Good pay and prospects.

Write in confidence, giving details of experience and qualifications, to:-

Manager

G. W. B. FURNACES LTD.

(Control Gear Division)

P.O. Box No. 4

Dibdale Works, Dudley, Worcs.

6555

**BRITISH ENGINE BOILER &
ELECTRICAL INSURANCE CO. LTD.**
Longridge House, Manchester, 4

ELECTRICAL SURVEYOR required in Scotland, also in Manchester. Permanent positions carrying progressive salary scale £800 to £1,100 and non-contributory pension. Candidates, aged 26 to 32, with H.N.C. in Electrical Engineering or Grad. I.E.E., and with apprenticeship in manufacture or repair of electrical machinery, are invited to apply stating age, qualifications and experience. 6581

**CONTROL GEAR
DESIGN ENGINEER**

A QUALIFIED Electrical Engineer is required by a well-established manufacturer of Electric Motor Control Gear.

He should be capable of producing designs for motor control gear components from theoretical considerations, and should have a wide knowledge of contemporary materials and production techniques.

The appointment will carry a salary of not less than £1,750.

Reply in confidence with full details to—Box 6627.

**MERSEYSIDE AND NORTH WALES
ELECTRICITY BOARD**

ASSISTANT CONSUMERS' ENGINEER required at Towyn, in the Aberystwyth District. Salary within range £715/£805 per annum (N.J.B. E/11).

Applicants should have completed a recognised electrical apprenticeship, and had some technical training. Duties will include estimating, preparation of specifications and supervision of contracting work, advising consumers on matters relating to electricity supply and the utilisation of electricity. The ability to speak Welsh and to drive would be an advantage.

The work is of an interesting nature, and the post is pensionable, with good working conditions and reasonable future prospects to suitable staff.

Application forms obtainable from the Manager, No. 4 Sub-Area, Electricity House, Rhosyllen, Nr. Wrexham. Closing date, 14th November, 1960. 6607

**NORTH WEST METROPOLITAN
REGIONAL HOSPITAL BOARD**

CLERK OF WORKS (Engineering) required for supervision of site works in various establishments.

Applicants must have served an apprenticeship in mechanical or electrical engineering and have had not less than five years' experience supervising site installations. They must be capable of supervising both mechanical and electrical work.

Salary scale £800 × £40(5) × £50(1) to £1,050, plus £30-£50 London weighting. Superannuable, Whitley Council conditions.

Apply stating age, qualifications and experience, with names and addresses of two referees (preferably employers), to Secretary, North West Metropolitan Regional Hospital Board, 40, Eastbourne Terrace, London, W.2, quoting reference 859, by 16th November. 6591

LONDON ELECTRICITY BOARD**Assistant Distribution Engineer**

APPLICATIONS are invited for the above position in the Board's Surrey Suburban District, Durnsford Road, Wimbledon, London, S.W.19.

Applicants should have a sound technical education to the standard of the Higher National Certificate and possess practical experience of engineering work associated with the organisation of a District distribution department.

The post is graded under Schedule A of the National Joint Board Agreement as Class H, Grade 12, £875 per annum rising to £990 per annum, inclusive of London allowance.

Applications should be sent direct to the Manager, at the above address, within 14 days of the publication date of this notice, quoting ref. PER/V/3123/R. 6618

**SALOP COUNTY ARCHITECT'S
DEPARTMENT**

APPLICATIONS are invited from suitably qualified men for the post of ASSISTANT ENGINEER (heating and electrical). Duties include the supervision of building services contracts and the design and specification of heating and lighting schemes.

Salary Grade A.P.T. III/IV (£935 to £1,310 p.a.), commencing salary according to ability and experience. Car allowance. N.J.C. conditions. During the early stages of the appointment a separation or disturbance allowance can be paid to a married man pending the finding of housing accommodation.

Conditions of service and application forms obtainable from Ralph Crowe, A.A.Dipl., A.R.I.B.A., A.M.T.P.I., County Architect, Column House, London Road, Shrewsbury. Closing date, 25th November, 1960. 6606

JUNIOR DRAUGHTSMAN

for electric motor drawing office.

This position offers an opportunity for a young man to obtain further experience and training.

Apply giving details of age, experience, education and present salary, to:-

FULLER ELECTRIC LIMITED

Fulbourne Road, Walthamstow, London, E.17. 6616

Situations Vacant (continued)**CENTRAL ELECTRICITY
GENERATING BOARD**

South Wales Division
(Vacancy No. 285/ER/60)

APPPLICATIONS invited for the superannuable N.J.B. appointment of ASSISTANT SHIFT CHARGE ENGINEER at ABERTHAW POWER STATION, THE LEYS, ABERTHAW, NR. BARRY, GLAM.

Salary Schedule A, Class L, Grade 8, Scale 12, £1,350-£1,500 per annum, plus 10% shift enhancement.

Applicants should possess H.N.C. or equivalent qualifications, and have had operating experience in a modern power station.

Special application forms obtainable from Secretary, South Wales Division, Central Electricity Generating Board, Twyn-y-fedwen Road, Gabalfa, Cardiff, to be returned by 18th November, 1960. 6598

THE POLYTECHNIC

309, Regent Street, London, W.1

APPPLICATIONS are invited for a post as LECTURER, duties to begin on 1st January, 1961. Candidates should be qualified both academically and by industrial experience to lecture on general Electrical Technology and either Electrical Power Engineering or Telecommunication Engineering to B.Sc.(Engg.) and Diploma in Technology students.

The salary scale commences at £1,370, rising by annual increments of £35 to a maximum of £1,550, plus London allowance of £38 or £51 per annum.

A form of application, which should be returned not later than 19th November, 1960, may be obtained from the undersigned.

J. E. RICHARDSON,
Director of Education. 6582

CITY AND COUNTY OF NORWICH

ASSISTANT ELECTRICAL ENGINEER required. Salary A.P.T. Grade III (£935-£1,140) or the Special Grade (£840-£1,145) with casual car allowance, according to experience and qualifications. Applicants must have the Higher National Certificate or be Graduates of the Institution of Electrical Engineers, have served an apprenticeship in electrical installation work and have had experience in the design and supervision of street lighting, and interior lighting and power installations.

Applicants should state age, qualifications, training, experience, present and previous positions, giving salaries and dates, together with names of three referees.

Applications to the City Engineer, City Hall, Norwich, NOR 01A, by 17th November, 1960. 6594

**ELECTRICAL DEVELOPMENT
ENGINEER**

with experience in design and testing of Transformers and Battery Charging Equipment.

**ELECTRICAL DEVELOPMENT
ENGINEER**

with experience in design and testing L.V. Control Gear.

These vacancies are due to the expansion programme of Britain's leading fork truck manufacturer, whose factory is situated on the outskirts of a pleasant country town, one hour west of London.

Apply in first instance with full particulars to J. Dewar, Personnel Manager, Lansing Bagnall Ltd., Kingsclere Road, Basinstoke, Hants. 6491

SALES ENGINEER (INSIDE)

to handle customers' enquiries and orders for industrial electric motors. Successful applicant will probably be aged 25-35 and of H.N.C. standard.

Apply stating age, experience and present salary, to:—

FULLER ELECTRIC LIMITED

Fulbourne Road, Walthamstow, London, E.17. 6617

ASSISTANT electrical engineer required by national newspaper. Age 23/28. Electrical apprenticeship and Higher National. Must be first-class electrical draughtsman. Good prospects.—Box 6314.

ARMATURE winders urgently required in the London area, basic rate 5s. 8d. per hour plus substantial efficiency bonus.—Box 186.

ASSISTANT engineer (electrical) required for National Coal Board Central Engineering Establishment in the Technical Services Branch, to assist in the design and development of automatic control equipment. Experience in development work necessary, and experience in servo-mechanisms desirable. Sound technical and practical training required with H.N.C. Electrical or equivalent. Post permanent and superannuable. Salary range £825-£1,275. Applications giving full details of age, qualifications and experience should be sent to the Administrative Officer, National Coal Board, Central Engineering Establishment, Ashby Rd., Stanhope Bretby, Near Burton upon Trent, not later than 7th November, 1960. 6549

CHARGEHAND/electrician required with contracting experience. Able to lay out work on own initiative. Excellent prospects for right man. Write—Box ER.828, c/o Hanway House, Clark's Place, London, E.C.2. 6620

CONSULTING engineer requires for Dublin office design engineer for electrical services in large buildings. Applicants must have at least four years' experience. Reply in confidence to Varming & Mulcahy, 4, Northbrook Road, Dublin, giving details of experience, age, qualifications and salary expected. 6459

DESIGN engineer required for consulting engineers' office to undertake the design of electrical services for all classes of buildings including hospitals, industrial and commercial buildings, at home and abroad. Spring and summer holidays. Pension scheme and luncheon vouchers. Apply in writing, stating age, experience, present salary and salary required, to: J. Roger Preston & Partners, 15, North Audley Street, London, W.1. 6622

DESIGN engineer required for interesting and varied work on transformers, voltage regulators and control circuitry by company situated south of London. Minimum qualifications H.N.C. and 2 or 3 years' design experience. The company expects to pay a salary of at least £850 per annum, or at a higher level should successful applicant possess further academic qualifications or greater experience. Superannuation scheme, canteen and sports facilities. Support given should a house be required. Reply—Box 6460.

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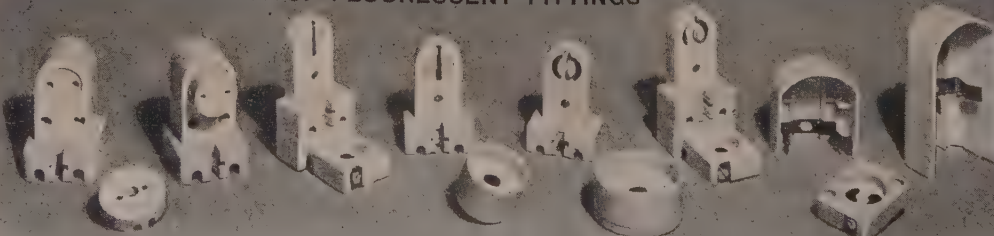
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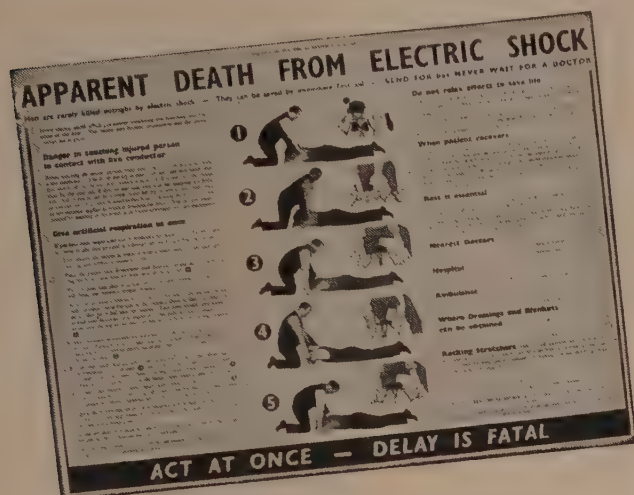


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Adcola Products Ltd. 24	Fenton Byrn & Co. Ltd. 3	Paxtons (Electrical) Ltd. 16	Stockfield Mfg. Co. Ltd. 90
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Asquith Electrics (Colne) Ltd. 66	Furse, W. J., & Co. Ltd. 113	Pirelli-General Cable Works Ltd. 81	
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Barber & Colman Ltd. 80	Gosheron, John, & Co. Ltd. 48	Rotork Eng. Co. Ltd. 92	Tullis Russell & Co. Ltd. 50
Bastian & Allen Ltd. 16	Heayberd, F. C., & Co. Ltd. 84	Rowlands Electrical Accessories Ltd. 98	
Benjamin Electric Ltd. Cover 2	Hiatt & Co. Ltd. 84	S. & D. Rivet Co. 89	Unistrut Division of Sankey-Sheldon Ltd. 13
Berry's Electric Magicoal Ltd. 54	Higgs Motors Ltd. 25	Sangamo Weston Ltd. 54	Universal Electrical Co. 114
Birmingham Mica Co. Ltd. 80	Hildick & Hildick 114	Savage Transformers Ltd. 26	Usekia 34
Bolton, Thomas, & Sons Ltd. 92	Ilford Ltd. 4	Sax, Julius, & Co. Ltd. 90	
Bray, E. N., Ltd. 114	Iliffe & Sons Ltd. 70	Scott, Hugh J. 85	Variletric Ltd. 8
Bray, Geo., & Co. Ltd. 78 & 79	Imperial Aluminium Co. Ltd. 72	Service Electric Co. Ltd. 61	Venesta Foils Ltd. 62
Brentford Transformers Ltd. 60	J.B. Electric Ltd. 66	Sheen (Nottingham) Ltd. 34	Venner Ltd. 7
British Insulated Callender's Cables Ltd. 9	Keyswitch Ltd. 1	Simmonds & Stokes (Niphan) Ltd. 84	Viscose Development Co. Ltd. 46
British Klockner Switchgear Ltd. 74	Lancashire Dynamo & Crypto Ltd. 56	Simplex Electric Co. Ltd. 55	Volex Electrical Products Ltd. 96
British Nylon Spinners Ltd. 20	Lancashire Dynamo Nevelin Ltd. Cover 4	Sims, F. D., Ltd. 96	
Brook Motors Ltd. Cover 1	Lead Development Association 68	Smiths Clocks & Watches Ltd. 93	Watson, R. & W., Ltd. 84
Bruce Peebles & Co. Ltd. 17	Leicester, Lovell & Co. Ltd. 21	Southern Trade Services Ltd. 66	Webber, R. A., Ltd. 68
Bullfinch Gas (Equipment) Ltd. 22	Litholite Insulators & St. Albans Mouldings Ltd. 86	Square D Ltd. 58 & 59	Wootton & Co. Ltd. 19
	Loheat Ltd. 88	Standard Telephones & Cables Ltd. 95	Zenith Electric Co. Ltd. 61
Cableform Ltd. 69	Londex Ltd. 31		
Carr, James W., & Co. Ltd. 24	London Electric Firm Ltd. 94		
Carter Gears Ltd. 83	London Electric Wire Co. & Smiths Ltd. 67		
City Electrical Co. 114	London Pressed Hinge Co. Ltd. 70		
Cohen, George, Sons & Co. Ltd. 6	Long & Crawford Ltd. 44		
Collins Electrical Ltd. 38			
Contactum Ltd. 94	M.K. Electric Ltd. 42		
Cryselco Ltd. 29	MTE Control Gear Ltd. 51		
	Macintyre, James, & Co. Ltd. 48		
De Bergue Machine Tools Ltd. 12	Manifold Electric Co. Ltd. 68		
Dorman & Smith Ltd. 14	Mathews Electric Ltd. 22		
Doylex Ltd. 24	Mek-Elek Engineering Ltd. 113		
Drayton Regulator & Instrument Co. Ltd. 57	Mercury Switch Mfg. Co. Ltd. 70		
Drummond, John (Engineers) Ltd. 88	Metway Electrical Industries Ltd. 31, 66 & 88		
Dzus Fastener Europe Ltd. 89			
	Midland Dynamo Co. Ltd. 12		
E.C.C. (Moulding Breakers) Ltd. 75	Midland Electric Mfg. Co. Ltd. 63		
E.D.L. Industries Ltd. 24	Midland Metallics Ltd. 113		
E.M.I. Electronics Ltd. 68	Mole, M., & Son Ltd. 91		
East London Mica Works 86	Monmore Tubes Ltd. 91		
Ekram Electric Ltd. 112	Mudie's Electrical Co. Ltd. 69		
Electric Elements Co. 34			
Electricity Services Ltd. 19	Palnut Co. Ltd. 34		
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Elliott Bros. (London) Ltd. 96			
Ellison, Geo., Ltd. 23			

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Vol.167 No.20-21

